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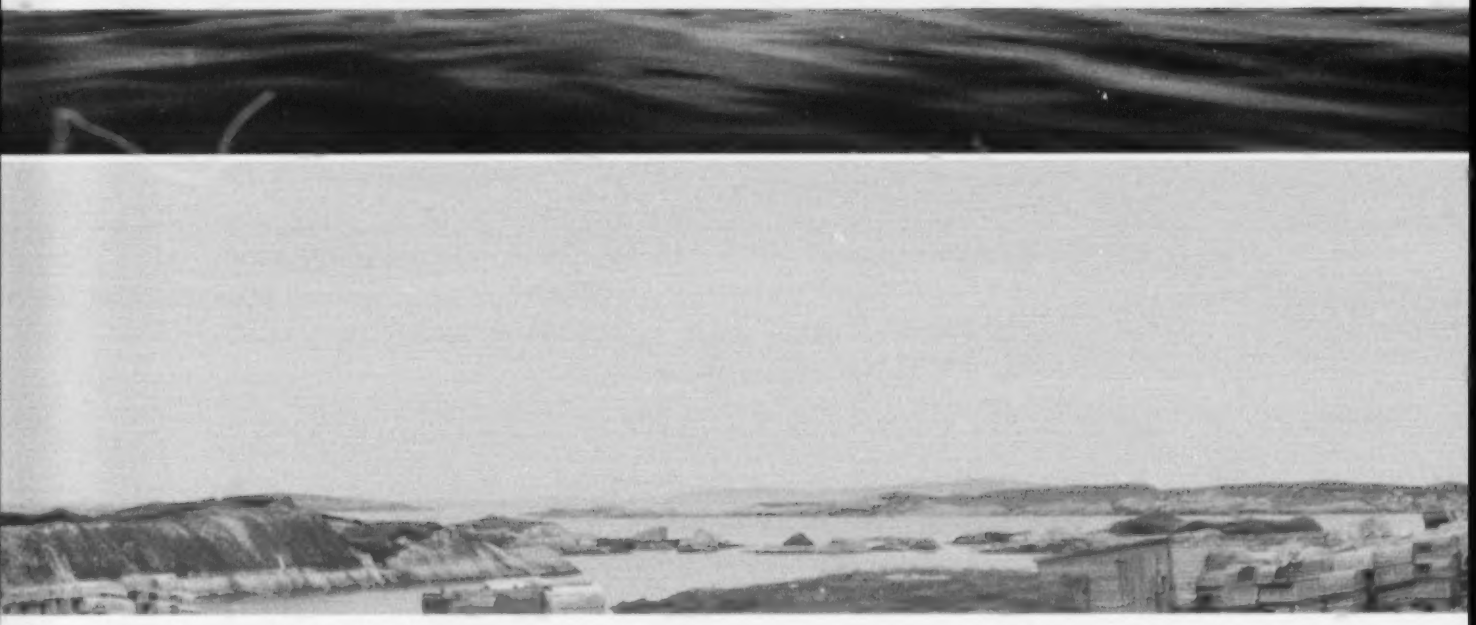

Economic Impact of Marine Related Activities in Canada

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Gardner Pinfold

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SUMMARY

About the report

Activities dependent on the oceans make a substantial contribution to the Canadian economy and the economies of its coastal regions. This report provides estimates of these economic impacts for 2006, using conventional indicators: GDP, employment and labour income.

The analysis covers all major private sector activities with a direct dependence on the oceans. These include extractive uses such as fisheries, oil & gas and aquaculture, as well as non-extractive uses such as shipbuilding, marine transportation, tourism and construction. The analysis also captures the activities of public sector organizations with responsibilities for safety, managing ocean activities and research.

Not all ocean activities could be covered in this study due to limitations on resources. These include professional services and high tech manufacturing, both of which contribute to the value derived from ocean resources.

Also, the report acknowledges that the oceans generate economic value in ways not easily quantified. These include ocean processes that influence climate and biodiversity, and that also provide valuable services including carbon sequestration, waste recycling and storing. The oceans also hold great potential as sources of renewable energy.

In light of what is excluded from consideration in the analysis, the estimates of economic impact should be regarded as *minimum* values.

National economic impact

Ocean sector activities generated an estimated $17.7 billion in direct GDP in Canada in 2006, creating over 171,340 direct jobs. The ocean sector accounted for 1.2% of the Canadian GDP in 2006 and for 1.1% of total Canadian employment (Table S-1).

When the scope of ocean sector activities is broadened to include spin-off impacts (indirect and induced activities), the relative importance of the ocean sector increases to 1.9% of national GDP and 2.0% of total employment.

Table S-1: Economic impact of ocean activities in the Canadian economy, 2006

	Ocean sector impact	Canadian total	Ocean as % of total
GDP ($ millions)			
Direct	17,685		1.2%
Direct plus spinoff	27,653		1.9%
		1,450,490	
Employment (FTE)			
Direct	171,365		1.1%
Direct plus spinoff	316,119		2.0%
		16,021,180	

Source: Table 5.3; Canada totals from Statistics Canada, Cat. No. 384-0002; 2006 Census.

Ocean activities vary widely in their comparative GDP, employment and income impacts (see Figures S-1 to S-3). Among the factors helping to explain these differences:

- **Offshore Oil & Gas:** this sector leads the next most important industry (transportation) by more than 100% in terms of contribution to direct GDP, but occupies a significantly lower position in terms of its employment and labour income impacts. The strong GDP result is due to the high returns to and of capital flowing from high petroleum prices, while the relatively low employment reflects the capital intensiveness of the industry.
- **Marine Transportation**: ranks second in contribution to GDP and employment and ranks first in labour income. The relatively high overall employment impact is attributable largely to the strong backward linkages to road and rail transportation and warehousing.
- **Tourism and Recreation**: the strong showing in employment creation is because this activity is essentially a service and tends to be labour intensive. Also, this study systematically quantifies all main segments of the tourism and recreation industry and so provides a comprehensive assessment that has been missing in past studies. The relatively low GDP impact is due mainly to the generally low wages and returns in the industry.
- **Seafood**: ranks a distant fourth in contribution to GDP and third in contribution to employment. The relatively low GDP is attributable to generally low returns on capital. The high direct employment figure is due to the labour intensiveness of the industry; a small-boat fishery, particularly on the east coast, supports numerous small processing plants. Few plants are mechanized, with most relying on labour to give them the flexibility they need to adjust to changing resource and market conditions.
- **Manufacturing and Construction**: There is relative balance among GDP, employment and income in the goods producing sector. This is not a large sector, generating less than $1 billion in GDP, but the impacts shown in Figures S.1-S.3 tell only part of the story. Missing from the impacts are marine products manufacturers whose activities are not distinguishable in the official statistics.
- **National Defence**: The contribution to GDP is through labour income only (governments do not generate profits), and consequently National Defence ranks below its relative position as measured by employment and income.
- **Public Sector and Research**: the federal and provincial government departments, universities and ENGOs comprising this sector occupy a relatively large presence in the marine economy as managers, stewards and researchers. With upwards of 70% of expenditures accruing as personnel salaries, most of the impact occurs at the direct stage; there is limited expenditure available to trigger significant indirect impacts.

Figure S-1

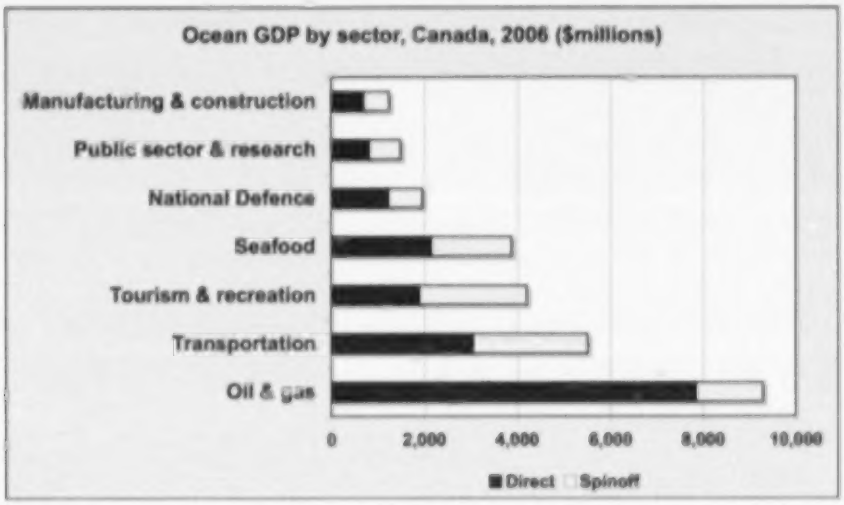
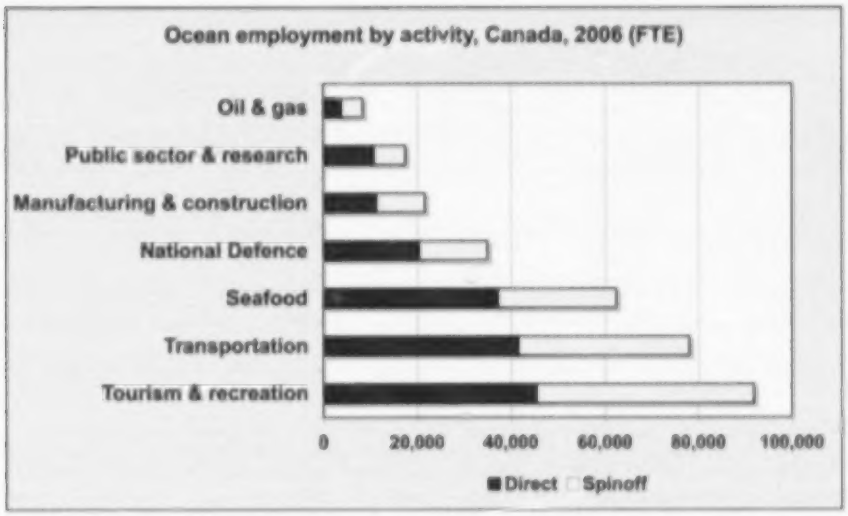


Figure S-2



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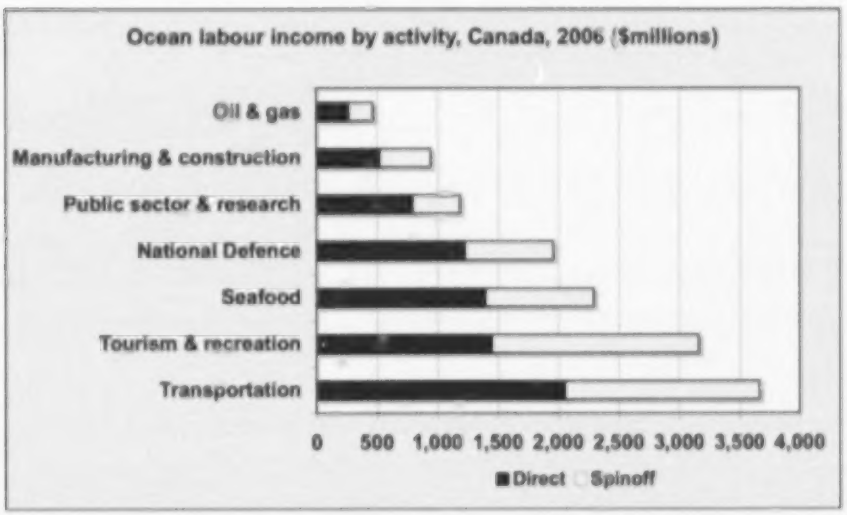


Regional economic impact – Atlantic Coast

Ocean sector activities generated an estimated $12.9 billion in direct GDP in the Atlantic region in 2006, accounting for 3.5% of regional GDP.* Ocean activities created over 97,600 direct jobs, contributing 2.0% of total Atlantic Canadian employment (Table S-2).

When the scope of ocean sector activities is broadened to include spin-off impacts, the relative importance of the ocean sector increases to 5.0% of regional GDP and 3.7% of total employment.

Table S-2: Economic impact of ocean activities in the Atlantic economy, 2006

	Ocean sector impact	Atlantic Canada total	Ocean as % of total
GDP ($ millions)			
Direct	12,923		3.5%
Direct plus spinoff	18,430		5.0%
		369,398	
Employment (FTE)			
Direct	97,619		2.0%
Direct plus spinoff	175,790		3.7%
		4,782,245	

Source: Totals from Statistics Canada, Cat. No. 384-0002; 2006 Census.

The Atlantic region accounts for about two-thirds of the overall national GDP impact and just over half the overall employment impact. Among the highlights of regional marine impacts:

- The high relative contribution to GDP at the national level is accounted for largely by offshore oil & gas activity, which is responsible for about 50% the Atlantic regional impact. But this capital-intensive industry accounts for just 4-5% of employment and labour income impacts in the Atlantic region.
- The seafood sector ranks second in overall GDP impact in the region, and leads in employment and labour income impacts. The impacts are felt throughout the region given the wide distribution of fishing, aquaculture and processing activities.
- Marine transportation ranks third in contribution to GDP and employment. The sector includes shipping and ferries as well as various port support activities. Impacts are concentrated in and around major ports in the region.
- Tourism ranks fourth in overall in contribution to regional GDP and second in its employment impact. The income impact tends to be relatively low, given the low wages paid in much of the industry.
- Two federal departments, National Defence and Fisheries and Oceans Canada, dominate public sector activities. Combined, they account for about 12% of GDP, just under 20% of regional employment and 25% of labour income.

* The Atlantic region includes the four Atlantic Provinces and Québec. Marine expenditures made by federal departments and agencies with headquarters in Ottawa are included in the Atlantic region total.

Regional economic impact – Pacific Coast

Ocean sector activities generated an estimated $4.8 billion in direct GDP in British Columbia in 2006, accounting for 2.6% of provincial GDP. Ocean activities created over 73,600 direct jobs, contributing 3.5% of total British Columbia employment (Table S-3).

When the scope of ocean sector activities is broadened to include spin-off impacts, the relative importance of the ocean sector increases to 5.0% of regional GDP and 6.7% of total employment.

Table S-3: Economic impact of ocean activities in the Pacific economy, 2006

	Ocean sector impact	British Columbia total	Ocean as % of total
GDP ($ millions)			
Direct	4,761		2.6%
Direct plus spinoff	9,221		5.0%
		182,743	
Employment (FTE)			
Direct	73,646		3.5%
Direct plus spinoff	140,204		6.7%
		2,092,765	

Source: Totals from Statistics Canada, Cat. No. 384-0002; 2006 Census.

The Pacific region accounts for about one-third of the overall national GDP impact and just over half the overall employment impact. Much of the difference between the Pacific and Atlantic in the respective contributions to the national impact is accounted for by the Atlantic offshore oil & gas industry. The marine resources in the Atlantic region also support a larger seafood industry.

Among the highlights of the Pacific region marine impacts:

- Marine transportation ranks as the leading marine activity in terms of contribution to GDP, employment and labour income. This reflects the importance of the west coast as a gateway to North American markets for Asian manufacturers, and also as a point of departure for Canada's raw material exports.
- The west coast supports a major marine tourism and coastal recreation industry, with this sector ranking second overall in its impact on GDP, employment and income.
- The seafood sector ranks third in overall impacts, with its relative importance declining substantially over the past decade following the collapse of salmon stocks. The impact has been offset to some extent by Atlantic salmon farming, which has quadrupled in value since the early 1900s.
- Two federal departments, National Defence and Fisheries and Oceans Canada, dominate public sector activities on the west coast. Combined, they account for about 10% of GDP and regional employment, and about 14% of labour income impacts.

Regional economic impact – Arctic Coast

Economic impacts for the Arctic are most meaningfully described and quantified using direct measures such as output value and expenditures. This is because the absence of a developed industrial/service economy and weak linkages among sectors limits the applicability of input-output modeling to estimate impacts.

The overall value of output from marine activities in the Arctic is estimated to have been $87 million in 2006, with $27 million accounted for by commercial activities and $60 million by public sector activities.

I

INTRODUCTION

1. Rationale

Activities dependent on the ocean make a substantial contribution to the Canadian economy. Fisheries and naval installations provided the rationale for the first European settlement. Fish processing, shipbuilding and marine transportation followed, providing the basis for economic development and growth on all three of Canada's coasts. These ocean activities defined settlement patterns that continue to this day.

New activities emerged over the years including tourism, aquaculture, bio-technologies, specialized manufacturing and oil and gas exploration and development. A wide range of service industries supports these activities. Together, they create substantial opportunities as well as challenges for more traditional uses.

A specialized public administration has evolved to provide stewardship leading to sustainable use. Objectives and guidance are embedded in the 1997 *Oceans Act*, with a full vision spelled out in 2002 in *Canada's Ocean Strategy*.

This study finds its rationale against this backdrop of on-going change in ocean activities and management, and the need to ensure decision-makers understand clearly the nature and economic significance of these activities. Specifically, the study is aimed at gaining greater insight into the full range of ocean activities and their contribution to the Canadian economy.

To this end, this report provides output values for marine-related activities covering the period 2002-2006, with estimates of the economic impacts for 2006. The last study of this kind was completed in 2003, covering the years 1998-2000.*

2. Purpose and objectives

This report aims to provide decision-makers, planners, industry and the general public with a measure of the relative economic importance of the oceans surrounding Canada on three sides. To this end, the main objective is to estimate the economic value of marine-related activities in Canada, and within its defined ocean regions: Atlantic, Pacific and Arctic. Within this broad objective are two more specific objectives:

- Describe and quantify existing marine-related commercial and public sector activities in terms of their economic impacts on national and regional economies.
- Estimate the value of emerging activities for which data are incomplete or unavailable.

* RASCL, *Canada's Ocean Industries: Contribution to the Economy, 1988-2000*, prepared for DFO, September 2003.

3. Contents

Following this Introduction, Chapter II sets out the methodology used to generate the economic impacts. Methodology includes a section identifying and defining the specific activities comprising the marine economy, and explains the distinction between primary and secondary activities. Data requirements and sources are identified, and any limitations specified. The methodology goes on to explain the approach used to measure the economic value of the specified marine activities, including the meaning of specific indicators and how direct, indirect and induced impacts are defined.

Chapter III sets out the national economic analysis of primary and secondary private sector activities. Each activity is described in qualitative and quantitative terms using industry-specific economic indicators as well as output value. Any data issues are identified. Economic impacts – estimated using the Statistics Canada Inter-provincial Input-Output Model – are set out for each activity using conventional indicators: GDP, employment and labour income. Also included in Chapter III is a section dealing with so-called secondary activities.

Chapter IV sets out the national economic analysis of public sector activities. This includes federal and provincial government departments and agencies, as well as universities and ENGOs.

Chapter V contains the roll-up of impacts at the national level as well as impacts for the Atlantic, Pacific and Arctic regions (a map delineating the ocean impact regions is set out in Figure 1.1). Though the study concerns marine activities, the economic impacts tend to occur on land. For this reason and because of the need to conform to established statistical units, the impact regions coincide with provincial and territorial boundaries.*

- **The Atlantic** region includes the four Atlantic Provinces and Québec. Following the Terms of Reference, marine spending by National Defence and Fisheries and Oceans headquartered in Ottawa is also included in the Atlantic region.
- **The Pacific** region consists of British Columbia.
- **The Arctic** comprises Nunavut, Northwest Territories, Yukon and Nunavik.

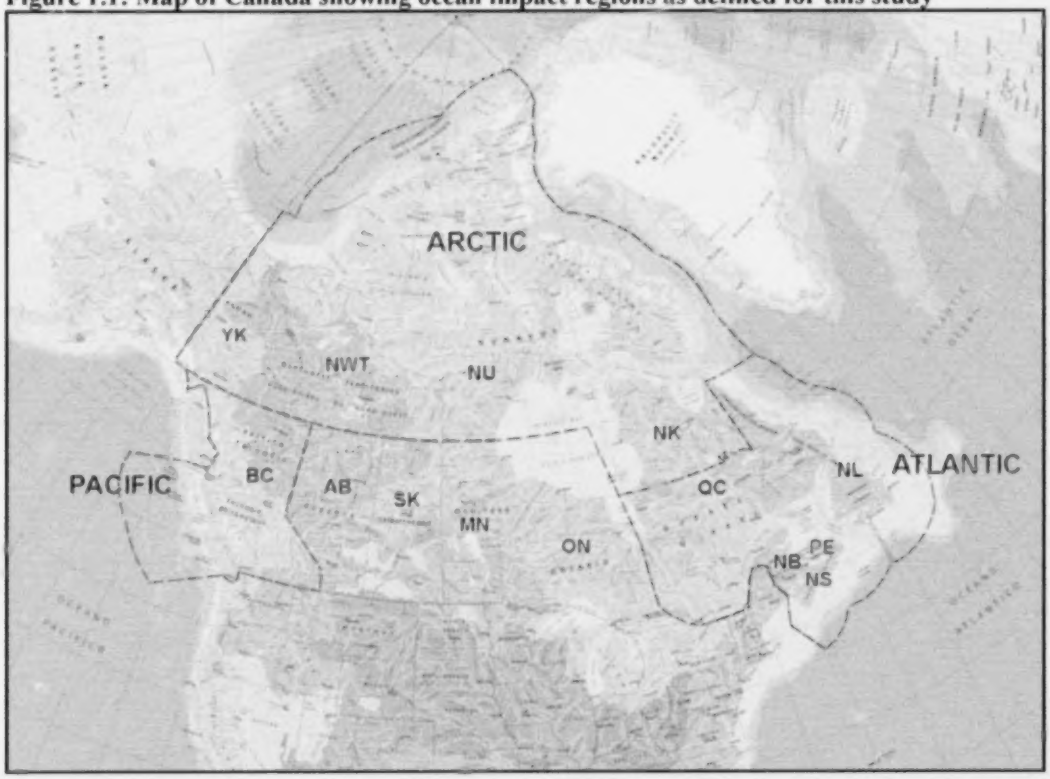
The national impacts are a summation of the results of Chapters III and IV, and are built up from regional impacts. The regional impacts are a summation of bottom-up impacts built from the aggregation of impacts at the provincial level.

Chapter VI sets out concluding observations, examining growth potential for each activity, emerging issues and methodological challenges encountered in producing the report.

Several activity-specific appendices contain details of the derivation of output value used to run the input-output model, where these data are not available from published sources.

* The reader should note that by defining the regions in this fashion, a small amount of marine activity occurring in Hudson Bay (mainly seasonal shipping through the Port of Churchill, Manitoba) is excluded from the impacts.

Figure 1.1: Map of Canada showing ocean impact regions as defined for this study



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II

METHODOLOGY

1. The ocean economy

This study is concerned with estimating the economic impact of marine activities. More specifically, it is concerned with the economic impact of marine activities occurring within Canada's economic zone in the Atlantic, Pacific and Arctic Oceans.

The marine economy includes those individual, industrial and administrative activities dependent on or related to the ocean. This is neither a precise nor a technical definition, but one that serves as a practical guide for identification of relevant marine activities. The list includes direct and indirect activities in the private and public sectors that are identified as either primary or secondary according to their relative economic importance and the state of knowledge about the activity (Table 2.1):

- **Primary marine activities:** these represent the core of the marine economy; industries deriving their economic rationale in a direct way from their extractive or non-extractive use of marine resources. Such activities include fishing, offshore oil & gas, ship and boat building and repair, water transportation, and marine construction. It also includes federal and provincial departments and agencies with management and administrative responsibilities over ocean uses.
- **Secondary marine activities:** these may be industries in their own right or form part of a broader industry grouping. Though their contribution to the economy may be picked up as indirect impacts by an economic model, they are singled out for attention in this study in order to shed more light on the nature and scope of the activity and the linkages with other sectors of the economy.

  The original intention was to conduct an analysis of the potential economic value of six of the secondary activities identified with an "X" in Table 2.1. As it turned out, three of the activities could be included in the full economic impact analysis as though they were primary activities. This is the case with Support Services for Oil and Gas Extraction (NAICS 213), coastal tourism and recreation (NAICS 4872) and Environmental Non-Governmental Organizations (ENGOs). This level of analysis became possible because sufficient data were obtained or developed to allow the impact methodology to be applied.

  A full economic impact analysis could not be carried out for the other three activities: subsistence fishing, refining and pipeline transportation. This is mainly because of data limitations. Nonetheless, each is described, with a discussion of possible analytical approaches, data requirements and challenges.

Table 2.1: Relevant marine sectors for economic impact analysis

			Focus of Analysis	
			Primary	Secondary
Private	**NAICS #**	**Industry**		
Seafood				
	114	Fishing	X	
	1125	Aquaculture	X	
	3117	Processing	X	
		Subsistence fishing		X
Offshore Oil & Gas				
	211	Exploration-Extraction	X	
	213	Support services		X
	32411	Refineries		X
	486	Pipeline transportation		X
Marine Transportation				
	4831	Freight & passenger transportation	X	
	4883	Support services for marine transportation	X	
Ocean-Based Recreation/Leisure				
		Recreational fishing	X	
	4831	Cruise Ship Travel	X	
	4872	Coastal tourism/recreation		X
Marine Construction				
	23712	Oil & Gas facilities installation	X	
	23799	Ports, harbours & marine works	X	
		Other (cable, renewable energy, etc)		
Manufacturing				
	33451	Navigation & guidance equipment	X	
	3366	Ship & boat building	X	
		High tech Manufacturing		
Services				
	5416	Professional Services/Env Consulting		
		High Tech Services		
Public		**Department**		
Federal Government				
		Fisheries and Oceans	X	
		National Defence	X	
		Transport Canada	X	
		Environment Canada	X	
		Parks Canada	X	
		Natural Sciences & Engineering Research Council	X	
		Indian and Northern Affairs	X	
		Natural Resources Canada	X	
		Canadian Food Inspection Agency	X	
Provincial/Territorial Government				
		Fisheries & Aquaculture	X	
		Transport/Ferries	X	
		Energy	X	
Universities and research			X	
ENGOs				X

2. Measuring Impacts

Reporting on marine activities begins with a descriptive profile of each, setting out its nature and economic characteristics and providing an overview of its linkages with other marine sectors and the economy more generally. Key factors affecting activity performance and trends are discussed and quantified using industry-specific indicators. Relevant factors include resource conditions and markets, with performance measured using such indicators as production, number of establishments, employment and exports.

Following conventional practice, the economic impact is measured with three indicators:

- **GDP:** an industry's contribution to Gross Domestic Product represents its broadest measure of economic impact. The domestic product of an industry captures the value it adds to purchased inputs through the application of labour and capital. GDP represents the sum of the value added by each industry. Value added should not be confused with output value, since the latter would include the value of purchased inputs.
- **Labour income:** this captures payments in the form of wages and salaries (and shares of revenue in the case of fishing vessel crews) earned in the marine industries. Returns to labour in the form of wages, salaries and earnings form a key component of GDP. Industries paying relatively high average wages and salaries generate a correspondingly higher economic impact than industries paying lower average incomes.
- **Employment:** industry employment is important politically because of the significance generally attached to jobs, but from an economic impact perspective, the significance lies in the economic impact generated through the spending of employment income. The greater the employment and higher the average income, the more significant the industry in terms of economic impact. Unless otherwise indicated, employment is measured in full-time equivalents (FTE).

Economic impacts are generated through direct, indirect and induced demand in the economy expressed in terms of industry and consumer purchases of goods and services.

- **Direct impact:** refers to impact arising from the expenditures made by firms in the subject industries on the goods and services needed to produce industry outputs. For example, the fishing industry buys nets and traps from manufacturers; water transportation buys fuel from refineries.
- **Indirect impact:** refers to the inter-industry purchases triggered by the direct demand. For example, net makers buy monofilament line from manufacturers; refineries buy services from maintenance contractors; catering companies buy basic food products. These industries in turn buy more basic goods and services, and so on.
- **Induced demand:** refers to the demand created in the broader economy through consumer spending of incomes earned by those employed in direct and indirect activities. It may take a year or more for these rounds of consumer spending to work their way through an economy.

The sum of impacts flowing from each level of demand gives the overall economic impact of Canada's marine sectors. Generally, the greater the domestic supply capability at each level, the greater will be the economic impact. Conversely, the higher the import content, the weaker the domestic industry response (multipliers) and the lower the impact.

Quantifying economic impacts, then, begins with comprehensive data on the gross value of output for each of the marine activities selected for analysis. For private sector activities, gross value of output means revenues generated through sales; for public sector activities, gross value of output corresponds to total expenditures. As the expenditures needed to produce the output work their way through the economy, they generate the GDP, employment and labour income the study aims to quantify.

Economists rely on economic models to quantify impacts at a national, regional or provincial level. Models provide a simplified view of the economy, expressing the myriad demand and supply transactions in the productive process as a set of coefficients or quantitative relationships. These coefficients are based on empirical measurement of flows in the real economy.

This study uses an input-output model, specifically, the Statistics Canada Inter-provincial Input-Output Model (2005 version) to generate the economic impacts. The use of an input-output (I-O) model is considered most appropriate for this study because:

- An I-O model is capable of producing the desired outputs – the direct, indirect and induced impacts, provided it has "open" and "closed" versions. Running the open version allows labour income to "leak" out of the economy, with impacts confined to indirect effects. Running the closed version forces labour income to flow through the economy, resulting in an aggregate measure of indirect and induced impacts. The difference between the two runs represents the measure of induced impact. To determine induced impacts, Statistics Canada applies what it refers to as a partial closure of the model. This essentially captures first-round induced spending impacts, resulting in a conservative impact estimate.
- The I-O model is a matrix capturing inter-industry flows of purchases and sales, thus allowing impacts to be measured and reported at the highest resolution. General equilibrium and economic base models are structured at an aggregate economic level, lacking the sensitivity to accept industry-specific "shocks" and unable to produce industry-specific results.

To run the I-O model, Statistics Canada would raise industry expenditures by an arbitrary amount – typically $10 million – thus triggering the inter-industry flows of purchases and sales resulting in direct and indirect impacts. The impacts would be grossed up according to the ratio of the actual value of industry output (final demand) to the arbitrary $10 million shock.

Two disadvantages of using an I-O model are commonly cited: linearity of results and static inter-industry coefficients.

- **Linearity of results** implies that the economy does not encounter production constraints since the model will produce constant results according to the fixed coefficients embedded in it. This is a valid concern, though not one that affects this study given its scope and objectives (the study is not trying to measure the impact of a major change in expenditures that would be inconsistent with inter-industry relationships embodied in the I-O model).
- **Static coefficients** imply lack of technological innovation and no shifts in spending as a result of global competition. This is a valid concern if the model is not up-dated regularly. But given how slowly structural change occurs in an economy, as long as the model relies on industry data no more than 3-4 years old, such dynamic effects would be reflected in the coefficients. The Statistics Canada Inter-provincial Input-Output Model meets this test since just one year separates the model version (2005) from the impact year (2006). It should be noted that the employment impact is adjusted for the increase in the industrial wage index (2.1% from July 2005 to July 2006, according to Statistics Canada, Table 281-0039).

3. Data

Criteria

The study requires data for two main reasons: to describe marine activities in sufficient detail to allow the reader to develop a clear understanding of the nature of the activity and the extent of its economic significance; and, to drive the I-O model in order to generate reliable economic impact estimates. To these ends, the data compiled in the course of the study meet four key criteria:

- **Consistency:** data allow for comparability across industries and locations, and reflect standard economic theory describing measures of economic activity. This means the same data, methods and tools are used for each industry and in each province or area where impacts are measured. Most of the data originate with Statistics Canada or are consistent with Statistics Canada definitions. Key exceptions are commercial and recreational fisheries data, originating with Fisheries and Oceans Canada; cruise ship tourism data obtained from special studies; public administration, university and ENGO data obtained directly from relevant departments, agencies, universities and environmental organizations in the course of this study. *All output values are expressed in current dollar terms.*
- **Comparability:** data are consistent over time so that changes can be observed and measured. Failure in this respect results in uncertainty about whether what is observed is due to real change or merely to definitional differences. This means using standard classifications for industries under consideration. The North American Industrial Classification System (NAICS) is used for this study.
- **Accuracy:** while each marine activity represents a distinct industry for which direct, indirect and induced impacts can be measured, adjustments have to be made to eliminate double counting when calculating *total* impacts for certain indicators (e.g., employment). The potential for double counting is great in assessing impacts because of the interdependence of many activities. For example, the output from primary fishing forms a key input for fish processing, i.e., fishing represents an *indirect* activity of fish processing. Failure to make adjustments in data or results would lead to an overstatement of overall impacts.
- **Replicability:** data and methods should be one that others can repeat so that the analysis can be carried out periodically allowing time series measures of the ocean economy. This means that data, methods and models used should be readily accessible for future analyses. For this reason, data definitions, sources and methods used to derive data, are carefully explained in the text, tables and appendices, and any assumptions made explicit.

Availability and limitations

The results fairly represent the nature and extent of marine activities in Canada and each of its regions, though some data limitations exist (particularly with respect to the Arctic). With the exception of a general two-year lag in finalizing GDP estimates, the data strengths and weaknesses tend to be industry-specific and are discussed in the following chapter. In brief:

- **Fishing:** annual data on industry output (value of landings) are reported by DFO and Statistics Canada. Statistics Canada also reports GDP. Given the number of enterprises in the industry, data confidentiality is not an issue either at the national or provincial levels.
- **Aquaculture:** annual data on industry output (value of landings) are reported by DFO. Statistics Canada reports GDP. Data confidentiality is not an issue at the national level, though can be for some species in some years at the provincial level.

- **Fish processing:** annual data on industry output (value of production) and GDP are available from Statistics Canada. Given the number of enterprises in the industry, data confidentiality is generally not an issue either at the national or provincial levels.
- **Offshore oil & gas:** data on the value of output and GDP are confidential at the provincial level because of the limited number of enterprises in the industry. Data on the offshore segment of the oil & gas industry are not distinguishable from overall industry data at the national level. Estimates of the value of output are derived from crude oil and natural gas prices applied to production data (quantities) obtained from regulatory agencies (federal-provincial boards in Newfoundland and Labrador and Nova Scotia). See Appendix A.
- **Support services for oil & gas:** data on the value of output and GDP are confidential at the provincial level because of the limited number of enterprises in the industry. Data on the offshore segment of the support services industry are not distinguishable from overall industry data at the national level. Estimates of the value of output (expenditure data) are obtained from regulatory agencies (federal-provincial boards in Newfoundland and Labrador and Nova Scotia).
- **Marine transportation:** data on the value of output and GDP are available from published sources at the national level and at the provincial level, but not for all years due to confidentiality. Value of output at the provincial level can be obtained from Statistics Canada by special request.
- **Support services for water transportation:** data are included in a broad category "Support services for transportation" and not reported for the marine component. Estimation is necessary to determine value of output and impacts. See Appendix B.
- **Tourism:** surveys on activity levels (days) and expenditures by province are conducted by Statistics Canada, Fisheries and Oceans Canada and an industry association for the three main tourism sectors: coastal tourism, recreational fishing and cruise ship travel. Data from these surveys are readily available for recreational fishing and cruising, but require a special tabulation for coastal tourism and recreation. See Appendix C.
- **Marine construction:** this activity applies to two sectors, oil & gas and ports & harbours. Statistics Canada does not report output data for marine construction because this activity is captured within a broader construction category. Nonetheless, data are available from various sources including regulatory agencies for oil & gas, Fisheries and Oceans Canada for small craft harbours, port authorities for major port construction, National Defence for naval installations, and provincial agencies for ferry terminal construction. The overall estimate is considered conservative because data on private investment in marine facilities are excluded. See Appendix D.
- **Manufacturing:** Data on shipbuilding and repair and boat building are produced by Statistics Canada, though confidentiality limits their availability for certain years. Data on the manufacture of equipment for marine uses are not available because this sector is not captured as a distinct industry in NAICS.
- **Federal and provincial departments and agencies:** data at the national and provincial levels are obtained directly from the departments and agencies, though data for certain federal departments could be made available at the national level only, with regional breakdowns left to the consultant to estimate. Data for some departments require adjustment to avoid double counting. This is a problem mainly with transportation, where both Transport Canada and several provinces subsidize ferry services. See Appendix E.
- **Universities and ENGOs:** provincial-level data are obtained through surveys from universities and organizations.

III

ECONOMIC IMPACTS – PRIVATE SECTOR

1. Seafood sector

The sector

The Canadian seafood sector generates sales revenues in the $4 billion range, placing Canada generally amongst the world's top five exporting nations.

The sector is composed of three interrelated industries: fishing, aquaculture and fish processing:

- **Commercial fisheries**: NAICS #11411 – harvesting fish from natural habitat using specialized vessels and gear. Vessels include trawlers, seiners, trollers, long-liners and various open-decked boats used for lobster, crab and dive fisheries. Gear includes, trawl, long-line, purse seine, hook and line, and various traps and pots.
- **Aquaculture**: NAICS #11251 – establishments engaged in farm raising and production of aquatic animals in controlled environments and using various forms of intervention (e.g., net pens, cages, various suspension systems) to enhance production including stocking, feeding and protecting from predators and disease.
- **Seafood product preparation and packaging**: NAICS #31171 – establishments engaged in dressing, filleting, canning, smoking, salting and freezing fish, and shucking and packing shellfish. Factory ships are included in this industry.

The commercial fishing industry is composed of some 21,000 mainly independent fishing vessels (Table 3.1) employing about 40,000 (skippers and crew) in primarily seasonal fisheries. The number of vessels and licence-holders has dropped by about one-third on the Atlantic coast since the early 1990s, and by about half on the Pacific coast. The drop is due in part to the collapse of important stocks on both coasts (groundfish on the Atlantic and salmon on the Pacific), and also in part to changes in management systems (i.e., transferable quotas) that promote more efficient use of capital. Data outlining trends in the fisheries are set out in the discussion of regional impacts in Chapter V.

Table 3.1: Seafood sector structure, Canada, 2006

Commercial fisheries		Aquaculture		Processing	
Vessels	Jobs	Sites	Jobs	Plants	Jobs
21,000	40,000	2,906	5,450	752	38,100

Source: provincial departments of fisheries and aquaculture

Vessels sell their catches to processing plants or other intermediaries, with a small percentage going directly to consumers. There is vertical integration in certain fisheries (common ownership of fishing vessels and processing plants), though this represents a relatively small proportion of overall industry production. The fisheries are managed through a combination of limited-entry licensing, total allowable catches and individual quotas, fish size restrictions, seasons and gear and vessel restrictions.

The aquaculture industry is a mix of vertically integrated and independent operations (including contract growers), with 2,906 licenced sites (not all of which are active). Salmon accounts for 75-80% of production value, with mussels and oysters making up most of the balance. Many aquaculture operations process their own production, though aquaculture production also finds its way to plants serving the commercial fisheries.

The seafood processing industry consists of 752 establishments, employing some 38,100 workers in mainly seasonal jobs (Table 3.1). Most plants compete for raw material from independent fishing vessels, with vertical integration generally limited to high capital cost offshore fisheries, including those allowing factory vessels (e.g., northern shrimp, sea scallop and surf clam). The number of plants has declined since the early 1990s as the industry has consolidated in response to reduced supply and fewer vessels from which to secure raw material.

Production

Canada's commercial fisheries typically produce about one million tonnes (landed weight) of raw material annually, with a value in the $1.8-2.2 billion range (Table 3.2). The decline in the value of output since 2003 is attributable in part to reduced landings, but is due primarily to reduced revenues from exports to our major trading partner, the U.S. (due to the declining value of the U.S. dollar).

Aquaculture shows a steady increase in tonnage and value to 2006; the slight drop in value seen in 2007 resulted largely from pressure on exchange rates. Output value represents a mix of farm gate value and final product value since the official statistics include aquaculture processing as part of the aquaculture industry.

Through the early to mid-2000s, the final product value of the seafood industry overall (processing *plus* aquaculture; commercial fisheries output is included in processing) was stable at just under $5.0 billion, with about 80% destined for export markets. The abrupt decline in the value of processed output from marine fisheries in 2005 was offset by an increase in aquaculture production (Table 3.2). The decline is explained in part by the exchange rate shift, but also by an abrupt drop in 2005 in prices for snow crab, a major species in the Atlantic fisheries.

Table 3.2: Seafood production, Canada, 2003-2007

	Commercial fisheries Landings		Aquaculture Output		Processing Output	Seafood industry	Export Value
	tonnes	$000s	tonnes	$000s	$000s	$000s	$000s
2003	1,068,682	2,185,383	146,900	573,981	4,301,326	4,875,307	4,368,285
2004	1,130,260	2,213,428	138,400	526,828	4,313,610	4,840,438	4,306,948
2005	1,048,159	1,937,984	151,390	700,158	3,979,905	4,680,063	4,168,157
2006	1,030,041	1,820,281	167,800	895,031	3,962,305	4,857,336	3,951,772
2007	972,628	1,887,543	166,170	787,494	n.a.	n.a.	3,726,594

Source: DFO, http://www.dfo-mpo.gc.ca/stats-eng.htm; Statistics Canada, special tabulation
Statistics Canada, Cat. No. 301-0006

Data issues and adjustments

- In order to provide an estimate of the overall impact of the seafood sector, care must be taken to eliminate double counting of backward linkages to fisheries and aquaculture when estimating indirect and induced impacts of the processing industry. This is accomplished by forcing purchases from the fishing industry to zero when estimating the processing industry impacts.

Economic impact

The seafood sector generated $3.9 billion in GDP (Table 3.3) on total revenue of just under $4.9 billion in 2006 (Table 3.2). The sector created the equivalent of 37,255 full-time direct jobs (actual direct employment is about double due to seasonal variation) and another 25,200 in spin-off activities. This employment resulted in about $2.3 billion in household income.

Table 3.3: Economic impact of the seafood sector in Canada, 2006

GDP and Income in $000s Employment in full-time equivalent		Fishing	Aquaculture	Processing*	Seafood sector
Direct impact					
	GDP	929,861	289,010	932,433	2,151,304
	Employment	10,098	4,173	22,983	37,255
	Income	623,943	121,845	650,887	1,396,675
Indirect impact					
	GDP	220,891	204,659	566,486	992,037
	Employment	3,416	2,936	7,863	14,215
	Income	119,958	102,429	214,123	436,510
Induced impact					
	GDP	302,414	141,140	297,283	740,837
	Employment	3,447	2,012	5,625	11,084
	Income	213,573	70,409	178,830	462,811
Total impact					
	GDP	1,453,167	634,810	1,796,202	3,884,178
	Employment	16,961	9,121	36,472	62,554
	Income	957,474	294,683	1,043,840	2,295,997

*Processing industry indirect and induced impacts adjusted to eliminate double-counting of fishing activty

Source: Statistics Canada Interprovincial Input-Output Model, 2005 version.

2. *Offshore oil & gas sector*

The sector

The offshore oil & gas sector generated sales revenues in the $9.0 billion range (2006), with most of the production exported to the U.S.

The sector is composed of two interrelated industries: crude petroleum and natural gas extraction and support activities for oil & gas operations:

- **Extraction:** NAICS #211111 – this industry consists of establishments primarily engaged in the exploration, development and production of petroleum or natural gas from wells in which hydrocarbons flow using normal pumping techniques. Offshore facilities would include fixed or floating production systems, with hydrocarbons transported to shore facilities via ship or pipeline.
- **Support activities:** NAICS #213111/2 – this industry consists of establishments engaged primarily in performing activities on a contract basis for oil & gas operations. Included are exploration drilling and the various services needed to test a well and prepare it for production (running casing, cementing, perforating well casings, and acidizing and chemically treating wells).

Offshore oil & gas extraction activity is to date conducted only on the East Coast of Canada. Three crude oil projects have been developed and are in production on the Grand Banks off Newfoundland and Labrador (Hibernia, Terra Nova and White Rose), with another project in the planning stage (Hebron). One natural gas project has been developed and is in production on the Scotia Shelf off Nova Scotia (Sable), with another project in the planning stage (Deep Panuke). Given the substantial capital requirements to develop these projects (several billion dollars each), all projects are developed by consortia of major petroleum companies.

Table 3.4: Offshore oil & gas sector, operating costs and employment, 2006

	Extraction Operating		Support activities		
Projects	costs	Employment	Wells drilled	Cost	Employment
#	$ millions	FTE	#	$ millions	FTE
4	1,300	3,000	6	185	200

Source: CNLOPB/CNSOPB

Support services (exploration) activities consisted of six wells in 2006, all on the Grand Banks. Four of these were drilled to delineate the White Rose field, while two were exploration wells. A drilling program typically is conducted a jack-up or semi-submersible rig, supported by supply and safety vessels, helicopters and a range of well finishing and testing services. Exploration activities on the Grand Banks have been fairly steady over the past decade, while disappointing results on the Scotia Shelf have led to a drop-off in exploration in that area. Offshore exploration is an expensive activity, with wells typically costing in the $30-40 million range.

Production

The three oil projects combined to produce 125 million barrels of crude oil in 2008, with a total value of $12.9 billion (Table 3.5). The substantial increase in value since 2004 was due to rising oil prices, which more than offset the declining value of the U.S. dollar.

Similar increases in natural gas prices served to push the Sable gas production value to $1.5 billion in 2005. The decline in 2006 was due to reduced output, weaker prices and the reduced value of the U.S. dollar. Production recovered in 2007 with the addition of a compression platform, and with rising prices, revenues increased to an estimated $1.46 billion in 2008.

Table 3.5: Offshore petroleum production, Canada, 2002-2008

	Crude oil		Natural gas	
	million bbls	$ millions	bcf	$ millions
2002	104	4,082	193	827
2003	123	4,994	165	1,152
2004	115	5,681	153	1,096
2005	111	7,387	149	1,518
2006	110	8,108	134	1,014
2007	134	10,435	155	1,079
2008	125	12,917	164	1,462

Source: See Appendix A for derivation and sources

Data issues and adjustments

- Statistics Canada does not publish output and GDP data for the offshore sector due to confidentiality (too few producers). Applying crude oil and natural gas commodity prices to production data (available from the respective offshore petroleum boards) allows the value of output needed to estimate impacts to be derived. These results are shown in Table 3.5, with derivation of the estimates set out in Appendix A.
- The total nominal GDP impact is assigned to the respective provinces (Newfoundland and Labrador and Nova Scotia) because this is where production occurs. Estimating direct employment and income impacts is problematic because not all the expenditure triggering these impacts occurs in the provinces, and also because direct impacts are not reported due to confidentiality. These impacts are derived from the share of total expenditures occurring in the provinces (obtained from the respective offshore petroleum boards) and adjusted for published values for these indicators.

Economic impacts

The offshore oil & gas sector generated $9.3 billion in GDP overall (Table 3.6) on total revenue of $9.1 billion in 2006 (Table 3.5). The sector created 3,800 direct jobs and another 4,600 in spin-off activities. This employment resulted in over $465 million in labour income. It is worth noting that most of the direct GDP is accounted for by profits and debt payments (returns to and of capital), most of which leaves the provinces of origin (resource royalties remain). This does not mean that GDP should be adjusted. While GDP accurately captures the income produced *in* an area, it does not necessarily reflect income flowing to the economy *of* that area. In this respect oil & gas is simply an extreme example of many other industries where income accrues as payments to the owners of capital residing outside the area where that income is generated.

In addition to the employment and income created through field development and production, the producing provinces benefit greatly from royalties. In 2007 for example, Newfoundland and Labrador earned $1.5 billion in royalty payments, while Nova Scotia earned $380 million.

Table 3.6: Economic impact of the offshore oil & gas sector in Canada, 2006

GDP and Income in $000s Employment in full-time equivalent		Oil & gas extraction	Support services	Oil & gas sector
Direct impact				
	GDP	7,753,603	85,560	7,839,163
	Employment	3,334	488	3,822
	Income	227,039	35,340	262,379
Indirect impact				
	GDP	952,713	35,340	988,053
	Employment	2,800	271	3,071
	Income	115,558	13,020	128,578
Induced impact				
	GDP	435,316	26,598	461,914
	Employment	1,365	160	1,524
	Income	63,252	11,160	74,412
Total impact				
	GDP	9,141,632	147,498	9,289,130
	Employment	7,498	919	8,417
	Income	405,850	59,520	465,370

Source: CNLOPB/CNSOPB; Statistics Canada Interprovincial Input-Output Model, 2005 version.

3. Marine transportation sector

The sector

The marine transportation sector generates revenues estimated at $6.5 billion (2006), based on carriage of domestic and international cargoes on deep sea and coastal routes (excluding Great Lakes-St. Lawrence Seaway upstream from Montreal).

The sector is composed of two closely related industries: water transportation and support activities for water transportation:

- **Water transportation**: NAICS #48311 – this industry consists of establishments primarily engaged in deep sea, coastal, Great Lakes and St. Lawrence Seaway shipping services for freight and passengers (including ferries and cruise ships). [*Only the impacts arising from deep sea and coastal shipping (including ferries and cruise ships) are included in this study.*]
- **Support Activities for Water Transportation:** NAICS #4883 – this industry consists of four sub-components: port and harbour operations, marine cargo handling, navigational services (piloting, tugboat, docking, salvage) and other services to water transportation (cargo surveyors/checkers, vessel supply services, floating drydock for maintenance).

Marine transportation consists of the vessel side of the sector, capturing the activities of shipping and ferry companies only. The industry may be divided into two segments: "for-hire" and "own account". Only financial results for the "for-hire" segment are included in the official statistics. The industry excludes the marine transportation component of companies that integrate shipping into their operations ("own-account"). In 2006 after some years of analysis, Statistics Canada completed a satellite account in order to gain some insight into the magnitude of own-account activity. The report concluded that if own-account activity were included in the official statistics, it would more than double the size of the industry in terms of contribution to GDP. Vessel data in Table 3.7 includes both the for-hire and own-account segments of the industry.

Table 3.7: Marine transportation industry structure, Canada, 2007

Major ports		Canadian flag vessels			
Port Authorities	Transport Canada	Cargo		Ferries	
#	#	#	GRT	#	GRT
19	77	110	1,780	72	428

Source: Transport Canada, Transportation in Canada, 2007

Support activities for water transportation consists of the port/harbour side of the sector, capturing the activities occurring when ships enter port to load or unload cargo or transport passengers. This is not an indirect activity in relation to water transportation, but a distinct industry.

Canada has 96 major ports, 19 managed by Canada Port Authorities and 77 by Transport Canada. Of those managed by Canada Port Authorities, 15 are on either the Pacific (6) or Atlantic coast (9); and of those managed by Transport Canada, 55 are marine ports (40 Atlantic and 15 Pacific). For purposes of this study, activities at the CPA ports of Québec City and Montréal are included in the analysis. Upstream ports on the Great Lakes-St. Lawrence Seaway system are excluded.

Production

The marine component of the water transportation sector generated an estimated $6.3 billion in revenues in Canada in 2006. The water transportation segment (NAICS 48311) accounted for $2.8 billion, while support activities (NAICS 4883) contributed an estimated $3.5 billion (Table 3.8).

Table 3.8: Marine transportation sector production, Canada, 2001-2005

	Vessel movements	Cargo		Water transportation revenues	Support activities revenues	Total revenues	Pilotage assignments
	#	000 t	% container		$millions		#
2001	-	394,700	8.2	2,021	2,535	4,556	50,992
2002	40,048	408,141	9.0	2,191	2,748	4,939	51,118
2003	40,926	443,779	9.2	2,369	2,971	5,340	51,004
2004	40,705	453,280	9.9	2,429	3,019	5,448	51,917
2005	42,919	470,109	9.6	2,626	3,290	5,916	53,549
2006*	n.a.	n.a	n.a	2,783	3,487	6,270	n.a.

Source: Statistics Canada, Shipping in Canada 2005; Transport Canada, Transportation in Canada 2007
*2006 revenue data estimated from 2006 GDP using a 2005 GDP/Revenue ratio of .367.

Industry activity is characterized by rising vessel movements and increased cargo tonnage. Also of note in Table 3.8 is the increasing share of total tonnage accounted for by container traffic. This trend affects mainly three ports, Vancouver, Montreal and Halifax. Though increasing, the relatively small share of total tonnage accounted for by containers reflects the importance of Canada's marine ports in the shipment of bulk cargoes, including such commodities as petroleum, various metallic and non-metallic minerals and wheat. Pilotage assignments increased with vessel movements.

Data issues and adjustments

- Statistics Canada does not report GDP or other data separately for any of the activities supporting water, rail, truck or air transportation. Without such separate reporting, if a complete picture of the water transportation sector is to be developed, it is necessary to estimate the contribution of support activities using indirect methods. The estimate contained in Table 3.8 is based on historical data (1997-2000) that distinguished NAICS 48311 and 4883 and allowed the relative contribution to GDP of the industries to be determined (the ratio of 4883/48311 is 1.5:1.0). Working backwards from this ratio, it is possible to derive the output value for NAICS 4883 shown in Table 3.8. The GDP ratio is confirmed by current U.S. data for these industries (the U.S. Bureau of Census reports GDP for NAICS 4883 and support activities for other transportation modes). Applying this ratio to NAICS 48311 allows the derivation of NAICS 4883, providing a basis for estimating overall industry impacts (see Appendix B).
- Another deficiency lies in the exclusion of "own-account" shipping activity. While strictly speaking this activity is not by definition part of the water transportation industry, the failure to include it nonetheless results in a substantial underestimate of the contribution of the marine environment to economic well-being. A strong case can be made to address this deficiency by relying on satellite account estimates, which would effectively increase water transportation (NAICS 48311) impacts by 130%. Whether a case can be made for making the same adjustment to support activities (NAICS 4883) is more difficult to say. Presumably all or most of the support activities would be triggered by "own-account" vessels and captured in the NAICS 4883 data regardless of their industry designation, *provided they were trading at CPA or TC ports for which Statistics Canada data are compiled.* The extent of private port activity is not known and is not captured in the support activities data.

- Neither output (revenue) nor cargo data are available for 2006. Revenue for 2006 set out in Table 3.8 is derived by applying the 2005 GDP to revenue ratio (.367) to an estimate of current dollar GDP for 2006. The estimate is derived by applying 6% growth to 2005 GDP based on 2005/2006 real GDP growth for water transportation. GDP data by industry for 2006 in chained (2002) dollars are available from Statistics Canada.

Economic impact

The deep sea and coastal segments of the water transportation sector generated $5.5 billion in GDP overall (Table 3.9) on total revenue of just under $6.3 billion (Table 3.8). The sector created about 41,560 direct jobs and another 36,400 jobs in spin-off activities. This employment generated about $3.7 billion in labour income.

These impacts reflect only the "for-hire" component of the industry, and consequently represent a conservative estimate of the economic significance of the water transportation sector.

Table 3.9: Economic impact of the marine transportation sector in Canada

GDP and Income in $000s Employment in full-time equivalent		Marine transportation	Support activities	Marine transportation sector
Direct impact				
	GDP	1,211,790	1,826,641	3,038,431
	Employment	14,506	27,086	41,592
	Income	845,742	1,209,378	2,055,120
Indirect impact				
	GDP	497,318	633,509	1,130,827
	Employment	6,633	11,718	18,351
	Income	288,256	399,305	687,561
Induced impact				
	GDP	553,693	796,101	1,349,794
	Employment	6,380	11,713	18,093
	Income	382,854	540,755	923,608
Total impact				
	GDP	2,262,801	3,256,251	5,519,052
	Employment	27,518	50,517	78,035
	Income	1,516,852	2,149,437	3,666,289

Source: Statistics Canada Interprovincial Input-Output Model, 2005 version.

4. Tourism and recreation

The sector

Tourism is not classified under NAICS because it cuts across several established industries including transportation, accommodation and food service. Nonetheless, tourism is widely recognized as a major source of economic impact and for this reason is included as one focus of analysis within the range of marine activities.

Due largely to the scope and focus of data sources, tourism is broken down into three expenditure-driven areas for this analysis: marine recreational fishing, cruise ship travel, and coastal tourism in the form of water-based recreational activities. In each case the activities tend to be seasonal, lasting 2-6 months in most coastal regions of Canada. An overview of each activity with expenditure estimates is set out in Appendix C.

- **Recreational fishing:** this includes salt-water and estuarial fishing using charter vessels and guides, as well as own vessels and facilities.
- **Cruise ship travel**: this sector has emerged over the past decade as a major seasonal source of tourism activity. On the east coast, cruise lines offer return trips between northeast U.S. and ports on the St. Lawrence, with various ports of call in the Atlantic Provinces. On the west coast, Vancouver is a home-port, with several ports of call en route to Alaska.
- **Coastal tourism and recreation:** this includes ocean touring (whale watching, sightseeing, coastal hiking, diving, kayaking), as well as sailing, cruising and visiting beaches and other marine locations. This segment includes resident and international tourists, as well as local residents.

The data in Table 3.10 provide an overview of the key industry indicators, including average spending per trip or person that forms the basis of the impact estimates (*Note: estimates are based on actual expenditures; non-market values are not included*). With recreational fishing and coastal recreation, spending is on travel, accommodation, food, charters and equipment. With cruise ship travel, impacts are driven by expenditures by passengers and crew at ports of call. Excluded in the average spending figure in Table 3.10 is spending by the cruise ship on port fees, fuel and provisions. These are captured in Water Transportation.

Table 3:10: Tourism and recreation activity, Canada, 2006

Recreational fishing		Cruise ship			Coastal tourism*	
Days	Avg spend/day	Ship calls	Passengers	Avg spend/passenger	Days	Avg spend/day
000s	$	#	000s	$	000s	$
3,210	242	1,000	1,749	270	36,278	47

Source: Appendix C

*Recreational boating is not included in these figures, only in the total spending, since days of participation were not available.

Production

Marine tourism activity generated expenditures of about $4.3 billion in Canada in 2006. Spending by tourists engaged in coastal activities account for just over 73% of total spending, followed by recreational fishing at 17% and cruise ship travel at 10%. Appendix C provides a detailed explanation for the derivation of expenditures.

Table 3.11: Tourism expenditures in Canada, 2002-2006

	Recreational fishing $millions	Cruise ship $millions	Coastal tourism $millions	Total $millions
2002	693	334	n.a.	n.a.
2003	714	337	n.a.	n.a.
2004	736	411	n.a.	n.a.
2005	757	442	n.a.	n.a.
2006	778	472	3,093	4,344

Source: Appendix C

Data issues and adjustments

- Comprehensive data on the tourism sector are not systematically compiled in Canada. Estimates of tourism spending or impact tend to be either activity-specific or very broad, and generally gathered through surveys. An on-going deficiency in conducting ocean impact studies has been the lack of focus on ocean activities in conducting these surveys. As a consequence, ocean impact estimates have been partial at best, or at worst, comprehensive, but relying on difficult to verify assumptions.
- The estimates in this study are drawn from several sources. Two are focused on specific marine related tourism activities, cruise ship travel and recreational fishing. The others, including the *Travel Survey of Residents of Canada* (TSRC) conducted quarterly by Statistics Canada, and the Statistics Canada *Travel Activities and Motivational Survey* address tourism generally, but allows the analyst to extract participation data (days and expenditures in the case of the *Travel Survey*) on specific activities including several with an oceans focus. Another source, *Economic Impact of the Canadian Recreational Boating Industry* (2006), provides expenditure data by province, but only for 2006. Consequently, data are incomplete for 2002 – 2005.
- Taken together, these sources provide a good approximation of the economic impact of ocean tourism and recreation. Ordinarily, the weakest aspect of the analysis would lie in valuing coastal recreation. But in the absence of a specific survey directed at ocean recreation, the combination of the TSRC and Travel Activities Survey, coupled with the recreational boating analysis, provide the basis for a fairly comprehensive estimate of ocean recreation impacts (though non-market values are not included). More work is needed to estimate expenditures associated with local residents' beach activities.

Economic impact

The ocean tourism sector generated $4.2 billion in GDP overall (Table 3.12) on total expenditures of $4.3 billion (Table 3.11). The sector created over 45,400 direct jobs and another 46,400 jobs in spin-off activities. This employment generated almost $3.2 billion in labour income.

Table 3.12: Impact of ocean tourism in Canada, 2006

GDP and Income in $000s Employment in full-time equivalent		Recreational fishing	Cruise ship travel	Coastal tourism	Total marine tourism
Direct impact					
	GDP	338,992	205,463	1,345,598	1,890,053
	Employment	8,151	4,941	32,357	45,449
	Income	259,915	157,534	1,031,708	1,449,157
Indirect impact					
	GDP	233,318	141,413	926,133	1,300,864
	Employment	4,492	2,723	17,831	25,045
	Income	165,429	100,266	656,656	922,351
Induced impact					
	GDP	182,558	110,648	724,646	1,017,852
	Employment	3,838	2,327	15,237	21,402
	Income	142,452	86,340	565,449	794,240
Total impact					
	GDP	754,868	457,524	2,996,377	4,208,770
	Employment	16,482	9,990	65,424	91,896
	Income	567,796	344,140	2,253,812	3,165,748

Source: Statistics Canada Interprovincial Input-Output Model, 2005 version.

5. Marine construction

The sector

Marine construction consists of construction activity taking place in the marine environment. Two types of marine construction are included in this study: ports and harbours and offshore oil & gas development (installation of facilities). Under NAICS, marine construction falls under a broad construction category:

- **Other heavy and civil engineering construction**: NAICS #2379 – establishments primarily engaged in constructing heavy and civil engineering works involving specialized trade activities such as pile driving and dredging, including development of marine facilities.

Quantifying the impact of marine construction draws on four distinct data sources:

- Port Authorities and port operators/users (including BC Ferries) for construction of works including docks and cargo handling facilities
- Fisheries and Oceans Canada for construction and maintenance of small craft harbours
- Department of National Defence for construction and maintenance of naval bases and facilities
- Oil & gas industry for offshore field development.

Production

The value of marine construction activity in Canada ranged from about $420 to $590 million annually between 2002 and 2006, with an average annual capital expenditure of $535 million (the figures in Table 3.13 are adjusted for inflation and expressed in 2005 dollars). Development of offshore oil & gas fields off Newfoundland and Labrador and Nova Scotia accounts for about half the total. Economic impacts are estimated using the 5-year average capital expenditures. Expenditure details are set out in Appendix D.

Table 3.13: Marine Construction in Canada, 2002-2006

Expenditures in $000 (2005)	Ports	Small craft harbours	National Defence	Oil & gas	BC Ferries	Total
2002	95,435	n.a.	82,519	316,815	39,378	n.a.
2003	69,637	28,776	79,031	369,957	39,574	586,975
2004	83,291	27,931	73,060	329,124	73,630	587,036
2005	90,736	25,094	97,119	204,750	101,000	518,699
2006	139,563	27,504	88,534	118,272	45,806	419,679
5-year avg.	95,732	27,326	84,052	267,784	59,878	534,772

Source: Appendix D

Data issues and adjustments

- Ports data excludes construction at private ports and marinas for which data are not compiled. The figures in Table 3.13 consequently understate actual capital expenditures.
- Published reports for oil & gas development expenditures specify local (provincial) expenditures, but do not make a distinction between fabrication and installation of facilities. The figures in Table 3.13 consequently overstate what would be regarded as pure construction activity (installation). Nonetheless, even if not pure construction impacts, the figures do accurately capture the level of activity in the provinces that contributes to economic impact arising from offshore development.

Economic impact

The marine construction sector generated $440 million in GDP overall (Table 3.14) on total expenditures of $535 million (Table 3.13). The sector created about 2,410 direct jobs in 2006, and another 3,200 jobs in spin-off activities. This employment generated over $270 million in labour income.

Table 3.14: Economic impact of marine construction in Canada, 2006

GDP and Income in $000s Employment in full-time equivalent		Ports & harbours	Offshore oil & gas	Total marine construction
Direct impact				
	GDP	106,796	125,607	232,402
	Employment	1,569	841	2,410
	Income	69,417	65,926	135,343
Indirect impact				
	GDP	66,655	47,193	113,847
	Employment	1,572	423	1,996
	Income	57,287	16,067	73,355
Induced impact				
	GDP	53,708	41,282	94,990
	Employment	909	285	1,194
	Income	40,686	21,417	62,103
Total impact				
	GDP	227,158	214,082	441,240
	Employment	4,051	1,549	5,600
	Income	167,390	103,409	270,800

Source: Statistics Canada Interprovincial Input-Output Model, 2005 version.

6. Shipbuilding and repairing and boat building

The sector

The sector consists of two industries: shipbuilding and repairing and boat building. In 2006, they generated total revenues in the $1.1 billion range.

- **Ship building and repairing**: NAICS #336611 – this industry consists of establishments primarily engaged in operating a shipyard with fixed facilities including drydock and fabrication equipment capable of building and repairing ships (vessels not intended for personal use).
- **Boat building**: NAICS #336612 – establishments primarily engaged in the manufacture of boats (vessels intended for personal use, including fishing boats).

Canada's ship and boat building industry consists of some 810 establishments producing vessels for industrial and personal use in deep sea, coastal and inland waters. Since many types of watercraft can be used in either marine or freshwater applications, there is no straightforward way to isolate the marine component of the industry. The approach adopted in this study is to assign a marine designation according to the location of establishments, specifically to firms located on Canada's coasts. Using this approach reduces the total by about 225, to 585 establishments (135 shipyards, NAICS 336611; 450 boatyards, NAICS 336612). Total employment exceeds 6,700.

Table 3.15: Shipbuilding and boat building industry structure, Canada, 2006

Ship building & repairing*		Boatbuilding*	
establishments	employment	establishments	employment
135	2,800	450	3,900

Source: Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis33661este.html; Statistics Canada,Cat. No. 301-0006, Principal statistics for manufacturing industries
*Includes data from coastal provinces only

Production

The marine component of the ship and boat building industry generated output valued at an estimated $1.1 billion in Canada in 2006. The shipbuilding segment (NAICS 336611) accounted for $520 million, while the boat building segments (NAICS 336612) contributed an estimated $540 million (Table 3.16).

Table 3.16: Ship and boatbuilding (marine) industry production, Canada, 2002-2006

	Ship building & repairing*		Boatbuilding*		Total*	
	establishments	revenues	establishments	revenues	establishments	revenues
	#	$ millions	#	$ millions	#	$ millions
2002	68	608	289	550	357	1,158
2003	80	468	258	584	338	1,052
2004	191	517	665	552	856	1,069
2005	119	450	456	461	575	911
2006	135	521	450	543	585	1,065

Source: Statistics Canada, special tabulation; Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis33661este.htm
*Includes data from coastal provinces only

Data issues and adjustments

- Data confidentiality represents the most challenging issue for the shipbuilding and boatbuilding industries. The industries, particularly shipbuilding and repair, are small in the Atlantic provinces, with only a few establishments carrying on business. Statistics Canada may provide a special tabulation on value of output, though the data would be aggregated to meet confidentiality restrictions. Data by province combining the shipbuilding and boatbuilding industries is set out in Appendix E.

Economic impact

The ship and boatbuilding industry generated $803.5 million in GDP overall (Table 3.17) on total revenue of $1.1 billion (Table 3.16). The sector created over 8,940 direct jobs and another 7,100 jobs in spin-off activities. This employment generated over $674 million in household income.

Table 3.17: Economic impact of the ship and boat building industry, Canada, 2006

GDP and Income in $000s Employment in full-time equivalent		Shipbuilding	Boatbuilding	Industry total
Direct impact				
	GDP	317,730	144,660	462,390
	Employment	6,766	2,179	8,944
	Income	312,080	74,640	386,720
Indirect impact				
	GDP	95,820	54,250	150,070
	Employment	2,468	768	3,236
	Income	89,000	26,500	115,500
Induced impact				
	GDP	127,920	63,166	191,086
	Employment	3,013	872	3,885
	Income	138,599	33,301	171,900
Total impact				
	GDP	541,470	262,076	803,546
	Employment	12,247	3,819	16,066
	Income	539,679	134,441	674,120

Source: Statistics Canada Interprovincial Input-Output Model, 2005 version.

7. Secondary activities

The terms of reference for this study identifies several activities linked directly or indirectly to the ocean for which one or more of the following may apply: a) there is limited information about the nature and extent of the connection between the ocean and the activity in question; b) the activity may depend on marine and terrestrial inputs that are not easily distinguishable; c) the activity may be too amorphous or poorly developed to be captured as a distinct NAICS classification, so it is included in a broader industry grouping; and, d) even if none of these constraints exists, relevant output or GDP data needed to determine impacts may be confidential.

This section examines the issues for three activities: subsistence fishing, refining and offshore pipeline. A complete impact analysis is conducted for the other three secondary activities identified in the terms of reference for which a qualitative examination was to have been performed.

- **Subsistence fishing**: occurs in the Arctic amongst the Inuit peoples and in southern areas amongst First Nations on the Atlantic and Pacific coasts. In all areas, the extent of participation and harvest levels is poorly documented, if at all.

  Subsistence hunting and fishing provided almost all of the food and materials used by the Inuvialuit in the early 1900s. Ringed seal, bearded seal, bowhead and beluga whales, and many species of fish and waterfowl have all contributed to subsistence of early inhabitants. The blubber and meat were an important component of the diet for Inuvialuit and their dogs, though year-round available fish was probably the most important part of the diet. Inuvialuit traditional whale hunting has continued for domestic purposes, and seals are still hunted from the sea ice or from boats. The current wage economy and change in lifestyles has led to a significant decline in the subsistence harvest, in particular the decline in use of sled-dogs has reduced the need for protein sources to feed them. Some estimates indicate that current harvest levels are about one-third of what they were in the 1960s.

  Harvest studies for the Inuvialuit Settlement Region and for Nunavut only provide data up to 1999 and 2001 respectively. Recent reports, including the 2008 Economic Overview and Assessment Report for the Beaufort Sea LOMA, refer to these sources and work done by GSGislason and Associates in 2003 to estimate the associated economic value. In short, there exists a considerable gap in understanding the current scope and significance of subsistence fishing.

  Considering the latest harvest data, the 1999 and 2001 harvest estimates continue to be relevant. An approximate average of 1,200 Mt of edible weight from mammals, and just over 300 Mt of fish are captured each year. If the same average annual level of harvests could be assumed through to 2006, only the value of the harvest needs to be considered. A "Nunavik Comparative Price Index" study reported the changes in meat prices from 2000 to 2006. If the subsistence protein sources continue to be valued according to the replacement cost of protein sources in stores, these have increased approximately 20% since the GSGislason study. This would suggest a 2006 value of marine subsistence harvest activities of approximately $39 million.

  Among First Nations, the Food, Social and Ceremonial (FSC) fisheries qualify as subsistence fisheries, and in some cases may include sale of catch to defray fishing related costs. These fisheries are prosecuted subject to a range of management measures imposed by Canada and designed to limit effort and conserve fish stocks. These measures are set out in regulations according to agreements with each of the First Nations, and may include: limits per individual fisher per day, total allowable catch (TAC) for the First Nation, amounts considered to be for FSC purposes, limits according to certain fishing areas or other designations, and by-catch limits. These fisheries are also subject to many of the same restrictions customary of commercial fisheries including gear restrictions, legal size limits, fishing seasons, monitoring and reporting requirements.

Data on First Nations subsistence fishing is not available. Not only does the complexity of fishing arrangements make it difficult for DFO to provide estimates of quantities allocated, the monitoring and reporting of actual catches is limited or non-existent. This makes it impossible to quantify activities in economic terms. The allocation information is found in the text of numerous agreements, and in some cases these are further tied to TAC decisions that appear in other documents or result from annual negotiations with First Nations. Even if the necessary cross-referencing and follow-up research could be undertaken, some allocations are vague, referring only to amounts for individual fishers or FSC amounts. It would be necessary to investigate participation levels and interpretations of these definitions before estimates of the catch could be established. Even where catch data are collected, there is a lack of consistency and reliability of tracking methods across Canada. Consequently, Fisheries and Oceans does not report subsistence (FSC) catch data.

- **Refining:** refining could be described as a marine-dependent industry, depending on the source of crude oil. If crude is sourced from fields in offshore areas, then refining is to the oil as seafood processing is to fish – a backward linkage to an ocean resource. As such, it is conceptually correct to include offshore-supplied refineries in the class of marine related industries.

  While the conceptual hurdle is easily overcome, the methodological and data challenges are more serious. The difficulties and some possible solutions can be illustrated using the refineries in Atlantic Canada and crude oil produced offshore Newfoundland and Labrador ("Grand Banks crude") as an example.

  The Atlantic region has four refineries, one in each of Newfoundland and Labrador, Nova Scotia, New Brunswick and eastern Québec (there are also six refineries in Montreal). The four regional refineries have a combined capacity of 720,000 barrels of crude oil per day. The region has three producing oil fields, Hibernia, Terra Nova and White Rose, all offshore Newfoundland and Labrador. These fields have been producing at an average of about 300,000 barrels per day. So, under the best of circumstances, the offshore could supply about 40% of regional refining capacity.

  Before examining the challenges in quantifying impacts, it is worth noting that while the regional refineries are marine-related, they are not necessarily marine-dependent. All the refineries pre-date the development of the Grand Banks fields. Even today, with a crude source on the doorstep, the refineries depend mainly on imported sources of crude oil. In part, this has to do with how well Newfoundland crude approximates the specifications of the oil the refineries are designed to process (and whether blending is necessary or possible). And in part it has to do with competitive forces in global crude markets.

  The minimum requirements for estimating an industry's impact with confidence are data on the gross value of output and contribution to GDP. Gross revenue is available from CANSIM 301-0006 (industry output was valued at $63.2 billion in 2006), but even with 22 refineries in Canada, GDP data are not available even at the national level (due to confidentiality). If national data were available, it might have been possible to estimate the regional share of national GDP based on relative production (capacities are known and capacity utilization can be determined). The weakness in this lies in the different product slates (and hence, value) each refinery is capable of producing. Also, depending on capacity utilization and competitive conditions in regional petroleum product markets, refining margins (and hence, profits) can differ substantially from the national average.

Assuming these potential barriers could be overcome, there remains the problem of determining the share of crude throughput at the regional refineries that is accounted for by domestic offshore supply. Statistics Canada and the National Energy Board report on domestic supply and disposition by region. The data indicate that utilization of Grand Banks crude by Atlantic region refineries has steadily increased, reaching about 22% of total refinery requirements in 2007 (assuming 90% refinery capacity utilization, this means Grand Banks crude supplies about 3% of total refining requirements in Canada). Shipping data indicate that the balance of the Grand Banks production is exported to the U.S. northeast and Gulf coast, with some also used by one or more refineries in Montréal.

In short, the data needed to estimate the ocean impact arising from refining activity are not available from publicly available statistical sources. Publicly traded oil companies publish financial statements, but refining results tends to be consolidated with other business units, making it impossible to link values with refining. Moreover, not all refining companies are publicly traded (including Irving Oil, Canada's largest refinery). In light of the unavailability of key data and given the assumptions required, any estimate of economic impact would be open to question.

- **Offshore pipeline:** Canada has one pipeline transporting hydrocarbon produced offshore. It carries natural gas and liquids from the Sable project offshore Nova Scotia to a shore-based fractionation plant in the province. This offshore pipeline (and fractionation plant) form an integral part of the Sable production system, with the gas sold to customers at the point of entry into the land-based pipeline once it has been processed to meet sales gas specifications.

  The method for determining how the economic impact of an offshore pipeline would be estimated is no different from that for an onshore pipeline. Statistics Canada reports GDP for this industry (NAICS 4861 for crude oil and NAICS 4862 for natural gas) at the national level, though confidentiality concerns would limit data availability for some provinces (e.g., Nova Scotia).

  Beyond the confidentiality issue, the other limitation is that the data make no distinction between offshore and onshore pipelines. So even if pipeline data were published, in jurisdictions with both onshore and offshore systems (such as Nova Scotia), it could be a challenge to separate the onshore and offshore contributions to GDP with confidence.

  As an alternative, because the offshore pipeline in Nova Scotia is an integral part of the Sable project, one possible way of estimating its economic impact is to base the contribution to GDP (and other impact indicators) on its share of the total capital costs of the offshore project. This approach would provide a good approximation of its contribution to GDP impact because the project is so capital intensive, with most of the impact in the form of returns to and of capital (rather than labour income). Employment and labour income impacts are small, given the nature of the facility and its operation.

  Following this approach, the offshore pipeline accounted for about 25% of the total Sable capital cost. The Sable project accounted for about 15% of total offshore oil & gas revenues in 2006 (Table 3.5). Assuming the contribution to GDP is in proportion to the revenues from offshore oil vs. natural gas projects (there is no way of knowing this, given the data available), then the offshore pipeline would account for 3.75% of the offshore oil & gas GDP impact in Table 3.6 ($291 million in direct GDP).

- **Navigation and guidance systems**: This industry had been included as a primary industry, but impacts could not be estimated due to a lack of basic data. Though the industry manufactures products primarily for aeronautical applications, Industry Canada descriptive information on firms in the industry suggests that at least some of the output of about one-third of these firms would appear to have marine applications.

  It is not possible to provide an estimate of the economic impact of the marine component of this industry because basic financial and economic data are not available. The industry consists of 176 establishments with 7,180 employees. This industry as a whole had total revenues in the $1.5 billion range in 2006, with manufacturing value added of almost $800 million. Statistics Canada reports principal statistics for the industry as a whole (CANSIM 301-0006), but provides no information that would make it possible to distinguish the marine from the aeronautical segments.

  While it is possible that the marine segment of the industry may be isolated from the broad grouping at some point in the future, this may not happen for some years since it would appear to account for a relatively small proportion of industry output. And since it is the nature of the product or service, not the use to which it is put, that determines the industry designation, it seems unlikely that NAICS would be modified for this reason.

  In light of these constraints, two options would appear to be available to develop an estimate of the value of output derived from marine manufacturing: ask Statistics Canada to develop a satellite account, or, conduct an industry survey. The Industry Canada database of 176 establishments would be the starting point for the latter. But since the survey would be asking for sensitive financial information (essentially the same information Statistics Canada requests), experience suggests the likelihood of success is remote.

IV

ECONOMIC IMPACT – PUBLIC SECTOR

1. Department of National Defence/Canadian Forces

Structure and scope of activities

The Department of National Defence (DND) and Canadian Forces (CF) carry out three main roles under Canadian defence policy: protect Canadians at home; defend North America in cooperation with the United States; and defend Canadian interests abroad. Canadian Forces have three branches, operating under a unified command: Navy (Maritime Command), Air Force (Air Command) and Army (Land Command).

This study is concerned with the economic impact of activities conducted to deliver the Maritime Command (MARCOM) mission:

- Generate and maintain combat-capable, multi-purpose maritime forces to meet Canada's defence capability requirements;
- Provide security by safeguarding Canada's maritime approaches;
- Contribute to international and domestic security.

MARCOM, with headquarters in Ottawa, controls three maritime formations:

- **Maritime Forces Atlantic (MARLANT)** comprises the Canadian Fleet Atlantic, and has responsibility for Canada's Atlantic Area of Responsibility including the eastern Arctic. The fleet consists of 19 vessels, operating from CFB Halifax in Halifax, Nova Scotia. CFB Halifax includes HMC Dockyard, CFB Stadacona and the CF station in St. John's, NL. CFB Halifax also includes 12 Wing Shearwater (a lodger unit), home of the Sea King helicopter units and Fleet Diving Unit Atlantic. Two squadrons from 14 Wing Greenwood (Maritime Patrol and Transport and Rescue) provide air support to deliver the MARCOM mission.
- **Maritime Forces Pacific (MARPAC)** comprises the Canadian Fleet Pacific and has responsibility for Canada's Pacific Area of Responsibility. The fleet consists of 14 vessels, operating from CFB Esquimalt near Victoria, British Columbia. MARPAC is supported by 19 Wing Comox (Maritime Patrol and Transport and Rescue) and 443 Maritime Helicopter Squadron in Patricia Bay.
- **Naval Reserve Headquarters** located in Quebec City. Includes a CF Fleet School with responsibility for training reservists for active duty. The Naval Reserve is assigned specific maritime defence responsibilities including coastal patrol operations (serving as crews for 10 of Canada's Maritime Coastal Defence Vessels).

Table 4.1: MARCOM resources, 2006 (personnel includes those at MARCOM HQ, Ottawa)

Bases	Vessels	Personnel	
		Reg/civ	Reserves
6	33	20,840	4,600

Source: DND

Expenditures

DND allocates about $2.3 billion in direct expenditures annually to deliver the MARCOM mission. Human resources (regular, civilian and reservists) accounts for about 55% of the MARCOM budget, with operation and maintenance (O&M) accounting for 40% and capital 5%. O&M covers base, vessel and aircraft operations and maintenance including procurement of spare parts and equipment. Capital figures include only facility construction and upgrades, but exclude vessel construction and replacement (there have been no major vessel procurements during the 2002-2006 period). A breakdown is provided in Table 4.2.

Table 4.2: DND MARCOM employment and expenditures, 2002-2006

	Employment (#)			Spending ($000s)		
	Personnel	Reserves	Gross income	O&M	Capital	Total
2002	19,940	4,000	1,068,991	868,610	69,153	2,006,754
2003	20,140	4,050	1,130,952	883,153	67,900	2,082,005
2004	20,140	4,050	1,101,169	887,215	69,458	2,057,842
2005	20,640	4,750	1,128,181	915,981	97,119	2,141,280
2006	20,840	4,600	1,230,929	962,416	96,639	2,289,984

Source: DND, *Estimated Expenditures by Electoral District and Province*, annual reports;
DND, Cdr. Charles MacKinnon, pers. comm.

Data issues and adjustments

- The DND accounting system stores expenditures by program activity and object, and not by element or geography. Program activities and objects cut across CF elements (maritime, air and land). Consequently, compiling the data in Table 4.2 requires estimation and judgment on the part of DND staff and is subject to some uncertainty.
- DND publishes an annual report, "DND Estimated Expenditures by Electoral District and Province" that allows expenditure by Canadian Forces Base to be approximated. While this report provides useful aggregate employment and expenditure data, the document alerts the reader to potential limitations. Expenditures are assigned geographically by the postal codes to which the payments are sent. This works well for personnel, but can lead to underestimates where suppliers' head offices are not in the locations where goods and services are actually supplied. Estimates by base/province are set out in Appendix F.
- The O&M data in Table 4.2 are provided in aggregate form and need a further breakdown to the commodity level in order to drive the Statistics Canada Input-Output Model. This was accomplished with the assistance of accounting personnel at CFB Halifax.
- Capital reflects routine expenditures to maintain base facilities. These figures do not include capital for major vessel replacement. Such funding would be provided through the Cabinet and Treasury Board submissions process.

Economic impact

The maritime element of DND generated just under $2.0 billion in GDP overall (Table 4.3) on total expenditures of $2.2 billion (excluding capital) in 2006 (Table 4.2). It created over 20,400 direct jobs (regular and civilian personnel, excluding reservists) and another 14,600 in spin-off activities. The employment resulted in about $2.0 billion in household income.

Table 4.3: Economic impact of public sector activities in Canada, 2006

GDP and Income in $000s Employment in full-time equivalent		National Defence	Fisheries & Oceans	Other federal departments	Provincial departments	Universities	ENGOs	Total public Sector
Direct impact								
	GDP	1,225,623	586,354	65,095	82,255	75,810	35,622	2,070,758
	Employment	20,413	8,500	650	596	1,061	674	31,894
	Income	1,225,623	586,354	65,095	82,255	59,629	31,373	2,050,329
Indirect impact								
	GDP	282,225	294,719	14,595	17,932	15,836	4,819	630,125
	Employment	6,724	1,498	291	749	221	71	9,555
	Income	262,778	85,116	10,855	23,884	6,080	2,288	391,000
Induced impact								
	GDP	451,821	265,526	21,552	28,214	25,557	13,078	805,748
	Employment	7,910	2,987	277	373	338	219	12,103
	Income	471,145	216,288	18,372	15,790	19,539	11,161	752,295
Total impact								
	GDP	1,959,668	1,146,599	101,242	128,400	117,203	53,519	3,506,631
	Employment	35,046	12,985	1,218	1,719	1,620	964	53,552
	Income	1,959,545	887,757	94,322	121,929	85,248	44,823	3,193,624

Source: Statistics Canada Interprovincial Input-Output Model, 2005 version.

2. Department of Fisheries and Oceans

Structure and scope of activities

The Department of Fisheries and Oceans (DFO) and its special operating agency, the Canadian Coast Guard, are responsible for developing and implementing policies and programs in support of Canada's scientific, ecological, social and economic interests in oceans and fresh waters. The Department's guiding legislation includes the *Oceans Act*, which charges the Minister with leading oceans management and providing coast guard and hydrographic services on behalf of the Government of Canada, and the *Fisheries Act*, which confers responsibility to the Minister for the management of fisheries, habitat and aquaculture. The Department is also one of the three responsible authorities under the *Species at Risk Act*.

DFO's mission is to deliver three main outcomes:

- Safe and Accessible Waterways;
- Healthy and Productive Aquatic Ecosystems; and
- Sustainable Fisheries and Aquaculture.

To achieve this mission, DFO through its five main program activities provides a range of services including:

- **Fisheries and Aquaculture Management:** Working in collaboration to manage the commercial, recreational and Aboriginal fisheries; providing services to fishermen such as issuing licences and developing regulations; creating the conditions to support a vibrant and sustainable aquaculture industry; and ensuring compliance with environmental standards and regulations in support of economic development and other activities.
- **Coast Guard:** Working with security forces to ensure the safe and secure use of Canada's waterways, and helping with ship-to-shore communication, navigation, and clear passageways for safe water travel.
- **Oceans and Habitat:** Studying, conserving and protecting aquatic ecosystems, and conducting scientific research and related activities vital to the understanding and sustainable management of Canada's oceans and aquatic resources.
- **Science:** Providing high-quality environmental, stock assessment and hydrographic data, products and services, and developing and promote the wise use of technology to ensure the long-term health of Canada's waters.
- **Small Craft Harbours:** Maintaining a network of fishing harbours.

Table 4.4: DFO resources 2006 (marine only)

Fisheries and Oceans		Coast Guard		Total
Regions	Personnel	Vessels	Personnel	Personnel
6	5,126	114	4,200	9,326

Source: DFO special tabulation

Expenditures

DFO spends about $1.6 billion annually to deliver its mission, of which marine programs account for about 85% of expenditures and freshwater programs for 15%. Coast Guard accounts for about 40% of the budget, with 60% divided amongst DFO's other main program activities (Fisheries and Aquaculture Management, Science, Oceans and Habitat and Small Craft Harbours). Human resources accounts for about 40% of the DFO budget, with operation and maintenance (O&M) accounting for 50% and capital 10%. Expenditures for fiscal 2003-2007 (marine programs only) are provided in Table 4.5. Further detail on expenditures may be found in Appendix F.

Table 4.5: DFO expenditures (marine plus total), 2003-2007 ($000s)

		Marine			Freshwater	Total DFO
$000s	Salaries	O&M	Capital	Total		Budget
2003	548,166	676,173	173,120	1,397,459	246,610	1,644,069
2004	560,184	540,964	151,250	1,252,399	221,011	1,473,410
2005	586,197	556,069	142,192	1,284,458	226,669	1,511,127
2006	588,728	646,559	171,935	1,407,222	248,333	1,655,555
2007	513,617	711,919	143,913	1,369,449	241,667	1,611,116

Source: DFO special tabulation

Data issues and adjustments

- DFO estimates that 85% of its budget is marine related. This is based on a broad overview of departmental activities, not a program-by-program review. Consequently, the estimate may lead to a slight overstatement or understatement of the impacts. But since freshwater activities are known to represent a small part of the overall DFO budget, the cost of refining the estimate was deemed uneconomic.
- Capital reflects major capital expenditures mainly by Small Craft Harbours (for wharf construction) and Coast Guard (for vessel refits and smaller vessel acquisitions). These figures do not include capital for major vessel replacement. Such funding would be provided through the Cabinet and Treasury Board submissions process.

Economic impact

DFO generated $1.1 billion in GDP on total marine expenditures of $1.3 billion in 2006 (Table 4.3). It created over 8,300 direct jobs and another 4,400 in spin-off activities. Total employment resulted in over $870 million in household income.

3. Other federal departments

Structure and scope of activities

Of the 25 or so other federal departments who undertake marine related activities, seven are included in this study:

- **Transport Canada (TC):** The TC mission is to promote safe, secure and efficient transportation systems. TC promotes marine safety by regulating safety requirements of pleasure craft and commercial vessels; monitoring pleasure craft, commercial vessels, foreign-registered vessels entering Canadian waters and offshore drilling rigs to verify that they meet safety standards; and helping promote the safe operation of commercial shipping by certifying officers and crews on Canadian ships. TC develops and enforces security regulations, and works with national and international partners to prevent and manage security risks in marine and other transportation modes.

  Marine related spending of $231.3 million in 2006 accounted for 16% of total TC expenditures of $1,426 million. Of this total, $168.8 million takes the form of subsidies or statutory grants, leaving $65.5 million as departmental service expenditures (Appendix F).

- **Natural Resources Canada (NRCan):** Ocean-related responsibilities are threefold: geosciences for ocean management, delineation of Canada's continental shelf, and a mix of ocean-related activities crossing energy and mineral resource development, northern resources and development, and climate change impacts and adaptation. Geosciences for ocean management involves research and mapping to identify sensitive marine habitats in the Queen Charlotte Basin, Beaufort Sea and Placentia Bay, as well as support for planning in the five Large Ocean Management Areas. Delineation of Canada's Continental Shelf involves bathymetric surveys on the Grand Bank and in the Arctic to establish the outer limit according to the United Nations Convention on the Law of the Sea.

  Marine related spending of $25.7 million in 2006 accounted for 1.7% of total NRCan expenditures of $1,470 million.

- **Natural Sciences and Engineering Research Council (NSERC):** Funding from NSERC supports marine-related research by Canadian university students, professors, and some research and development companies. Considering the national aggregate for NSERC spending, the top marine research areas are: oceans, seas, and estuaries, environment, earth sciences, life sciences including biotechnology, and aquaculture. Although there are approximately 45 marine-related research areas in total, the aforementioned account for nearly 60% of the allocated funding in 2006.

  Marine related spending of $24.3 million in 2006 accounted for 2.8% of total NSERC expenditures of $859 million.

- **Canadian Food Inspection Agency (CFIA):** The CFIA mission is to protect human health by safeguarding Canadians from preventable health risks related to the food supply, as well as those associated with animal diseases transmissible to humans. These goals are accomplished through regulatory oversight of the agriculture and agri-food industries, using science as a basis for designing and delivering programs applied to food safety, animal health and plant protection, stewardship of the animal and plant resource base, and timely and effective response to potential threats to human health. The CFIA role in marine related activities is to inspect domestic and international fish processing plants (including those on factory vessels) and approve and monitor quality assurance programs.

  Marine related spending of $10.9 million in 2006 accounted for 1.7% of total CFIA expenditures of $637.6 million.

- **Environment Canada (EC):** The mandate is to preserve and enhance the quality of the natural environment; conserve Canada's renewable resources; conserve and protect Canada's water resources; forecast weather and environmental change; enforce rules relating to boundary waters; and coordinate environmental policies and programs for the federal government. Specific marine related activities include expenditures on coastal action programs, Canadian Wildlife Service and environmental protection.

  Marine related spending of $9.8 million in 2006 accounted for 1.2% of total EC expenditures of $838.4 million.

- **Parks Canada Agency (PCA):** The Agency is developing a network of marine conservation areas (MCAs) to represent 29 marine natural regions found in Canada's Atlantic, Arctic and Pacific oceans, and the Great Lakes. Three MCAs have been designated, one of which is in a saltwater ecosystem: the Saguenay-St. Lawrence Marine Park. Work is underway to explore priority areas of interest and two proposed marine conservation areas in the Pacific including: Gwaii Haanas, and the Southern Strait of Georgia.

  Marine related spending of less than $5 million in 2006 accounted for less than 0.9% of total expenditures of $534.7 million.

- **Indian and Northern Affairs Canada (INAC):** The natural resources branch of INAC is at the intersection of the organization's marine-related activities including: offshore energy and minerals development, international polar year, contaminants research, climate change and adaptation research, and other circumpolar marine-based environmental research. The McKenzie Gas development has led to the organization's involvement in a wide range of research, some of which is related to marine resources, as part of the requirements under the Canadian Environmental Assessment Act. Many of the important food sources for northern residents are derived from the ocean including whales, seals, and various fish species.

  Marine related spending of about $1.0 million in 2006 accounted for about 0.1% of total INAC expenditures of $906 million.

Expenditures

These other federal departments spent an estimated $307.9 million on marine related programs and activities in 2006 (Table 4.6). Transport Canada accounts for 75% of the total. About 60% of TC spending takes the form of subsidies for various ferry services and the St. Lawrence Seaway Management Corporation.

Table 4.6: Marine related expenditures by federal departments, 2006

	Spending ($000s)		
	Marine activities	Department total	Oceans as % of total
Transport Canada	231,270	1,426,000	16.2%
Natural Resources Canada	25,670	1,470,000	1.7%
Natural Sciences and Engineering Research Council	24,300	859,000	2.8%
Canadian Food Inspection Agency	10,855	637,600	1.7%
Environment Canada	9,800	834,400	1.2%
Parks Canada	5,000	534,700	0.9%
Indian and Northern Affairs Canada	1,000	906,000	0.1%
Total	307,895	6,667,700	4.6%

Source: Departments/Agency, special tabulations

Data issues and adjustments

- Transport Canada expenditures include subsidies and transfers to public and private enterprises in the marine transportation industry. These transfers enter the calculation of impacts of the marine transportation industry. Accordingly, to avoid double counting, these transfers are excluded in determining the impact of TC expenditures. Further detail may be found in Appendix F.

Economic impact

Through $142.2 million in expenditures (net of transfers) on marine activities, the seven federal departments and agency generated $110 million in overall GDP in 2006 (Table 4.3) and just under 1,500 jobs, generating about $100 million in total labour income. Indirect impacts tend to be low for these government departments because most of the expenditures are made on personnel salaries.

4. Provincial/territorial departments/boards

Structure and scope of activities

Though the provinces and territories have limited jurisdiction over marine issues, they tend to be active in four main areas:

- **Fisheries and aquaculture:** each of the coastal provinces and territories has a separate department, or a branch of a department of natural resources, dedicated to fisheries and aquaculture. Though they have no direct role in managing commercial fisheries, the departments play a major role in managing aquaculture and share responsibility with the federal government for licensing and overseeing the fish processing industry.

  The provinces spent $40.3 million on fisheries and aquaculture programs and activities in 2006.

- **Transportation:** intra-provincial ferries are operated by private companies, Crown corporations, or by provincial departments of transportation. In all cases, a substantial share of the provincial transportation budgets is directed towards ferry operating subsidies.

  The provinces spent $136.3 million to support marine transportation in 2006.

- **Offshore oil and gas:** federal-provincial boards regulate offshore oil & gas activity in the waters off Nova Scotia and Newfoundland and Labrador. Provincial departments of energy provide advice on geological matters and royalties, and on local industry participation in procurement for offshore projects.

  The boards and provinces spent $27.8 million to regulate and manage offshore activities in 2006.

- **Tourism:** coastal provinces allocate significant resources promoting marine tourism.

  The provinces spent an estimated $35.9 million to support marine tourism in 2006.

Expenditures

Provincial departments and boards spent an estimated $260 million on marine related programs and activities in 2006 (Table 4.7). Transportation accounted for just over 50% of the total, with most of this used to support various intra-provincial ferry services.

Table 4.7: Provincial/territorial marine related expenditures, 2006 ($ millions)

	Fisheries & aquaculture	Transportation	Offshore oil & gas	Tourism	Other	Total
2006	40,250	136,250	27,750	35,925	19,500	259,675

Source: provinces, territories; CNSOPB, CNLOPB

Data issues and adjustments

- Provincial expenditures include support for coastal ferries. These transfers enter the calculation of impacts of the marine transportation industry. Accordingly, to avoid double counting, these transfers are excluded in determining the impact of provincial expenditures.

Economic impact

To estimate the economic impact, $130 million is deducted from total expenditures to account for the direct financial support for coastal ferries ($6 million is included to reflect administration). The remaining $130 million in expenditures on marine activities generated $125 million in overall GDP in 2006 (Table 4.3). Almost 1,700 were employed in delivering departmental services, generating $119.0 million in total labour income. Indirect impacts tend to be low for provincial government departments because most of the expenditures are made on personnel salaries.

5. Universities and ENGOs

Structure and scope of activities

Universities

Many Canadian universities offer programs and conduct research in the marine area, though unfortunately, data on program and research expenditures are not compiled in any systematic fashion.* Universities obtain research funding from several federally-funded sources including the Natural Sciences and Engineering Research Council (NSERC), Social Sciences and Humanities Research Council (SSHRC) and the Atlantic Innovation Fund (AIF), as well as the private sector. Again, while it is possible to (roughly) identify research funding that may be marine-related from grant titles, such data are not systematically compiled.

Another approach is to compile marine research and program expenditure data directly from universities. Such a study was completed in 2007, focusing on Canadian universities with the largest marine research programs and course offerings.** The Canadian universities selected for this study report expenditures exceeding $105 million (Table 4.8) to support major oceans programs or host marine research institutes covering such areas as oceanography (physical, chemical), marine biology, naval architecture, marine environmental law, ocean sciences, hydrodynamic testing facilities, fisheries and aquaculture:

- Dalhousie University
- McGill University
- University of British Columbia
- Memorial University
- Université de Québec a Rimouski
- University of Victoria

This $100 million plus expenditure estimate is considered conservative mainly because not all universities were covered in the survey, and also because even for the universities surveyed, not all marine related expenditures are necessarily captured. University accounts are not set up to be responsive to this kind of enquiry. The expenditure data had to be pieced together from numerous sources within each university including interviews with heads of department and research institutes, and administration staff.

ENGOs

Several national and regional environmental non-governmental organizations (ENGOs) have oceans campaigns addressing such issues as the marine environment and fisheries. Expenditures on marine-related programs are estimated at $46.4 million. Including the value of volunteer time would increase the value of output to over $100 million.

These organizations are primarily engaged in research, education, advocacy, and sometimes non-profit service or product delivery such as eco-certification. These activities may focus on marine species, habitats, capture and culture fisheries practices, coastal or offshore resource management issues. Most of the expenditures are for labour, some for equipment including boats, fuel, and supplies.

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* Estimates provided for marine related research expenditures are considered conservative due to the challenge of fully capturing the activities of researchers. The Oceans Management Research Network (OMRN) maintains a database of university programs with marine components. It lists 57 Canadian universities and colleges offering 344 programs with at least some marine content. The database is descriptive of programs; it contains no expenditure data associated with these programs.

** Gardner Pinfold, *Ocean Expenditures by Universities in Canada*, 2006; prepared for Fisheries and Oceans Canada.

The expenditure estimates are based on data obtained for the following organizations:

- GreenPeace
- David Suzuki Foundation
- Conservation Council
- Living Oceans Society
- SeaChoice
- EcoPEI
- Clean Nova Scotia
- World Wildlife Fund
- Sierra Club of Canada
- Ecology Action Centre
- Nature Canada
- Canadian Parks & Wilderness Society
- Nature Québec
- EcoTrust Canada

ENGO marine expenditures are estimated through three sources: the annual reports of several organizations, and the Statistics Canada Non-Profit Satellite Account and a report on the British Columbia ocean sector.* The direct expenditures from the two sources correspond closely, accounting for about 40% of the total. The balance of the value is accounted for by volunteer time as estimated by Statistics Canada.

The estimate is considered conservative since not all organizations with a marine interest are represented and not all expenditures are necessarily captured. Impact estimates are based on expenditures only; they exclude the value of volunteer time.

Expenditures

Total expenditures for universities and ENGOs exceeded $153 million in 2006 (Table 4.8).

Table 4.8: University and ENGO ocean-related expenditures, 2006

Universities	ENGOs	Total
	$ millions	
105.4	46.4	151.8

Source: Gardner Pinfold, Ocean expenditures by Universities in Canada, 2006; Statistics Canada, Non-Profit Satellite Account ENGOs annual reports (various). GSGislason & Associates, *Economic Contribution of the Oceans Sector in British Columbia*, 2007

Economic impact

Through the $105.4 million in expenditures on marine programs and activities, universities generated $117.2 million in overall GDP in 2006 (Table 4.3). Over 1,600 were employed, generating $85 million in total household income.

Through the $46.4 million in expenditures on marine programs and activities, ENGOs generated $53.5 million in overall GDP in 2006 (Table 4.3). Over 960 were employed, generating $44.8 million in total household income.

* GSGislason, *Economic Contribution of the Oceans Sector in British Columbia*, 2007. The estimate for BC ENGOs contained in this report is some $9.0 million higher than in GSGislason (2005 base year) because some organizations reported higher expenditures in 2006 and also because this report includes some ENGOs not captured by Gislason.

V

ECONOMIC IMPACT – NATIONAL & REGIONAL

1. National impact

Gross value of output

Marine activities had a gross value of output of just over $30 billion in Canada in 2006 (Table 5.1).* About two-thirds of this output was generated in Atlantic Canada and one-third in Pacific Canada. Offshore oil & gas activity on the east coast accounts for most of the difference in total output between the Atlantic and Pacific regions. Marine activities in the Arctic accounted for about 0.2% of the national total.

Table 5.1: Gross value of output by marine activity, Canada and regions, 2006

Gross value of output ($000s)	Atlantic	Pacific	Arctic	Canada
Private Sector				
Seafood				
Commercial fishing	1,501,372	318,909	6,000	1,826,281
Aquaculture	467,565	427,466		895,031
Fish processing	3,234,566	727,739	5,000	3,967,305
Offshore oil & gas				
Oil & gas exploration/extraction	9,121,886			9,121,886
Support activities for oil & gas	186,000			186,000
Transportation				
Marine transportation	872,600	1,911,000		2,783,600
Support activities	1,003,000	2,484,000		3,487,000
Tourism & recreation	1,590,981	2,743,930	2,556	4,337,467
Manufacturing & construction				
Shipbuilding	470,000	237,000		707,000
Boat building	150,000	209,000		359,000
Oil & gas facilities construction	267,785			267,785
Ports and harbours construction	134,422	132,567		266,989
Sub-total private sector	17,498,805	8,872,702	13,556	26,379,063
Public sector				
National Defence	1,643,200	550,225		2,193,425
Stewardship				
Fisheries & Oceans	1,021,609	302,648	45,192	1,369,449
Other federal departments	74,600	42,700	4,500	121,800
Provincial departments	71,975	47,000	10,000	128,975
Universities	64,215	41,200		105,415
ENGOs	9,776	36,600		46,376
Sub-total public sector	2,885,375	1,020,373	59,692	3,965,440
Total	20,384,180	9,893,075	73,248	30,344,503

Note: Commercial fishing output is an input to fish processing, so is excluded from the total.
Source: Tables 5.15, 5.25 and 5.29.

* For private sector activities, gross value of output means revenues generated through sales; for public sector activities, gross value of output corresponds to total expenditures.

Overall impact of ocean activities

Ocean sector activities generated an estimated $17.7 billion in direct GDP in Canada in 2006, creating over 171,000 direct jobs. Table 5.3 (next page) provides a summary of overall impacts, grouping activities into seven main sectors to facilitate presentation and discussion.

The ocean sector accounted for 1.2% of the Canadian GDP in 2006. In creating 171,000 direct jobs, ocean activities accounted for 1.1% of total Canadian employment (Table 5.2).

When the scope of ocean sector activities is broadened to include spin-off impacts (indirect and induced activities), the relative importance of the ocean sector increases to 1.9% of national GDP and 2.0% of total employment.

Table 5.2: Ocean activity in the Canadian economy, 2006

	Ocean sector impact	Canadian total	Ocean as % of total
GDP ($ millions)			
Direct	17,685		1.2%
Direct plus spinoff	27,653		1.9%
		1,450,490	
Employment (FTE)			
Direct	171,365		1.1%
Direct plus spinoff	316,119		2.0%
		16,021,180	

Source: Table 5.3; Canada totals from Statistics Canada, Cat. No. 384-0002; 2006 Census.

The slight difference in the relative impact of GDP and employment on corresponding national totals is attributable mainly to the structure and performance of the offshore oil & gas industry. It is highly capital intensive and generates substantial returns to and of capital, resulting in relatively low employment per unit of GDP (this is evident from a comparison of the oil & gas industry in Figures 5.1 and 5.2).

Comparative impact of ocean activities – structure and performance

Ocean activities vary widely in their comparative GDP, employment and income impacts. Among the factors that help to explain these differences:

- **Offshore Oil & Gas:** this sector leads the next most important industry (transportation) by more than 100% in terms of contribution to direct GDP, but occupies a significantly lower position in terms of its employment and labour income impacts. The strong GDP result is due to the high returns to and of capital flowing from high petroleum prices, while the relatively low employment reflects the capital intensiveness of the industry.
- **Marine Transportation**: ranks second in contribution to GDP and employment and ranks first in labour income. The relatively high overall employment impact is attributable largely to the strong backward linkages to road and rail transportation and warehousing.

Table 5.3: Economic impact of marine activities (Atlantic and Pacific only), Canada, 2006

Output, GDP and Income in $000s Employment in full-time equivalent	Output	Direct			Indirect			Induced			Total		
		GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income
Private Sector													
Seafood													
Commercial fishing	1,820,281	929,861	10,098	623,943	220,891	3,416	119,958	302,414	3,447	213,573	1,453,167	16,961	957,474
Aquaculture	895,031	289,010	4,173	121,845	204,659	2,936	102,429	141,140	2,012	70,409	634,810	9,121	294,683
Fish processing	3,962,305	932,433	22,983	650,887	566,486	7,863	214,123	297,283	5,625	178,830	1,796,202	36,472	1,043,840
Offshore oil & gas													
Oil & gas exploration/extraction	9,121,886	7,753,603	3,334	227,039	952,713	2,800	115,558	435,316	1,365	63,252	9,141,632	7,498	405,850
Support activities for oil & gas	186,000	85,560	488	35,340	35,340	271	13,020	26,598	160	11,160	147,498	919	59,520
Transportation													
Marine transportation	2,783,600	1,211,790	14,506	845,742	497,318	6,633	288,256	553,693	6,380	382,854	2,262,801	27,518	1,516,852
Support activities	2,487,000	1,826,641	27,086	1,209,378	633,509	11,718	399,305	796,101	11,713	540,755	3,256,251	50,517	2,149,437
Tourism & recreation	4,334,911	1,890,053	45,449	1,449,157	1,300,864	25,045	922,351	1,017,852	21,402	794,240	4,208,770	91,896	3,165,748
Manufacturing & construction													
Shipbuilding and boat building	1,066,000	462,390	8,944	386,720	150,070	3,236	115,500	191,086	3,885	171,900	803,546	16,066	674,120
Oil & gas facilities construction	267,785	125,607	841	65,926	47,193	423	16,067	41,282	285	21,417	214,082	1,549	103,409
Ports and harbours construction	266,989	106,796	1,569	69,417	66,655	1,572	57,287	53,708	909	40,686	227,158	4,051	167,390
Sub-total private sector (1)	26,371,507	15,613,744	139,471	5,685,394	4,675,698	65,914	2,363,855	3,856,473	57,182	2,489,074	24,145,916	262,567	10,538,323
Public sector													
National Defence	2,193,425	1,225,623	20,413	1,225,623	282,225	6,724	262,778	451,821	7,910	471,145	1,959,668	35,046	1,959,545
Stewardship													
Fisheries & Oceans	1,344,560	586,354	8,500	586,354	294,719	1,498	85,116	265,526	2,987	216,288	1,146,599	12,985	887,757
Other federal departments	98,450	65,095	650	65,095	14,595	291	10,855	21,552	277	18,372	101,242	1,218	94,322
Provincial departments	249,860	82,255	596	82,255	17,932	749	23,884	28,214	373	15,790	128,400	1,719	121,929
Universities	105,415	75,810	1,061	59,629	15,836	221	6,080	25,557	338	19,539	117,570	1,620	85,248
ENGOs	46,376	35,622	674	31,373	4,819	71	2,288	13,078	219	11,161	53,886	964	44,823
Sub-total public sector (2)	3,917,546	2,070,758	31,894	2,050,329	630,125	9,555	391,000	805,748	12,103	752,295	3,507,366	53,552	3,193,624
Total	30,289,053	17,684,503	171,365	7,735,722	5,305,824	75,469	2,754,856	4,662,221	69,285	3,241,369	27,653,282	316,119	13,731,947

1. Sub-total of output value excludes commercial fishing because the value of fisheries output is included in fish processing.

2. Sub-total of output excludes provincial transportation subsidies (provincial ferries) because these are included in marine transportation revenues.

3. Employment impact is adjusted for the increase in the industrial wage index (2.1% from July 2005 to July 2006. Source: Statistics Canada, Table 281-0039).

4. Indirect and induced impacts of fish processing are adjusted to eliminate double counting of commercial fishing activity.

Figure 5.1

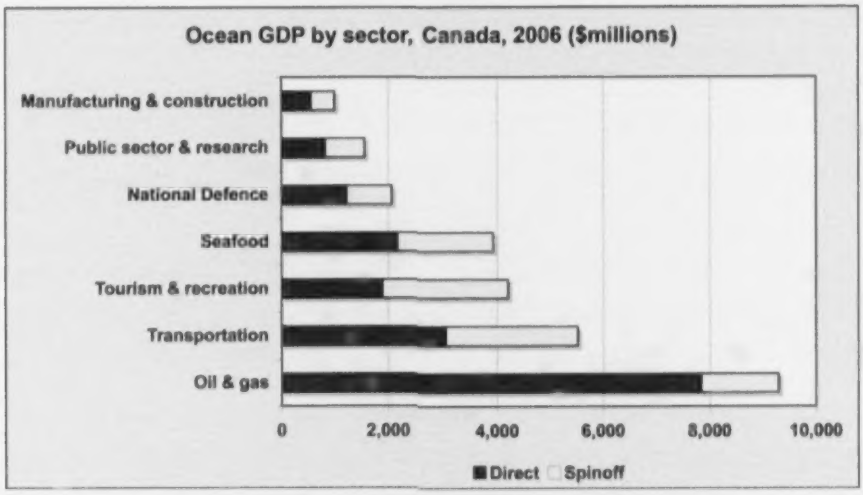


Figure 5.2

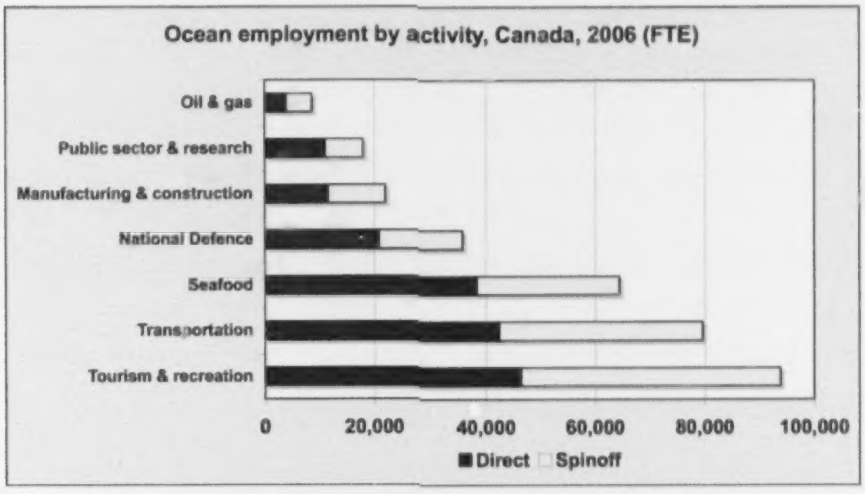
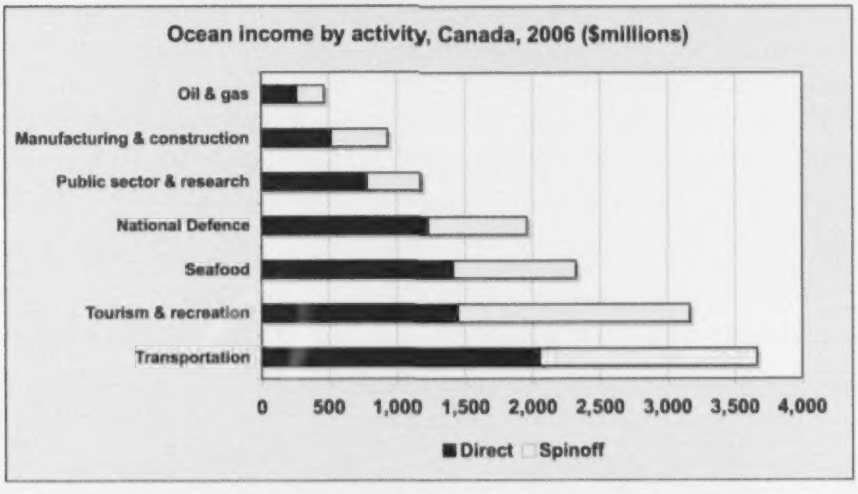


Figure 5.3



- **Tourism and Recreation**: the strong showing in employment creation is because this activity is essentially a service and tends to be labour intensive. Also, this study systematically quantifies all main segments of the tourism and recreation industry and so provides a comprehensive assessment that has been missing in past studies. The relatively low GDP impact is due mainly to the generally low wages and returns in the industry.
- **Seafood**: ranks a distant fourth in contribution to GDP and third in contribution to employment. The relatively low GDP is attributable to generally low returns on capital. The high direct employment figure is due to the labour intensiveness of the industry; a small-boat fishery, particularly on the east coast, supports numerous small processing plants. Few plants are mechanized, with most relying on labour to give them the flexibility they need to adjust to changing resource and market conditions.
- **Manufacturing and Construction**: There is relative balance among GDP, employment and income in the goods producing sector. This is not a large sector, generating less than $1 billion in GDP, but the impacts shown in Figures 5.1-5.3 tell only part of the story. Missing from the impacts are marine products manufacturers whose activities are not distinguishable in the official statistics.
- **National Defence**: The contribution to GDP is through labour income only (governments do not generate profits), and consequently National Defence ranks below its relative position as measured by employment and income.
- **Public Sector and Research**: the federal and provincial government departments, universities and ENGOs comprising this sector occupy a relatively large presence in the marine economy as managers, stewards and researchers. With upwards of 70% of expenditures accruing as personnel salaries, most of the impact occurs at the direct stage; there is limited expenditure available to trigger significant indirect impacts.

2. Atlantic region impacts

Seafood Sector

Activity

- **The commercial fishing industry** is composed of some 19,000 mainly independent fishing vessels (Table 5.4) employing about 32,000 (skippers and crew) in primarily seasonal fisheries. Lobster, crab and shrimp are the main species.
- **The aquaculture industry** is a mix of vertically integrated and independent operations (including contract growers), with 2,320 licenced sites (not all of which are active). Salmon accounts for 75-80% of production value, with mussels and oysters making up most of the balance.
- **The seafood processing industry** consists of 510 establishments, employing some 34,400 workers in mainly seasonal jobs. Most plants buy from independent fishing vessels, with vertical integration generally limited to high capital cost offshore fisheries, including those allowing factory vessels (northern shrimp, scallop and clam).

Table 5.4: Seafood sector structure, Atlantic Canada, 2006

Commercial fisheries		Aquaculture		Processing	
Vessels	Jobs	Sites	Jobs	Plants	Jobs
19,000	32,000	2,320	3,350	510	34,400

Source: provincial departments of fisheries and aquaculture

Production

Atlantic Canada's commercial fisheries have produced about 800-900,000 tonnes (landed weight) of raw material annually, with a value in the $1.5-1.9 billion range (Table 5.5). The value of production has declined since 2002 due in part to reduced landings of key species, and also to the strengthening of the Canadian dollar.

The Atlantic fisheries have undergone a major structural change since the early 1990s when the industry was dependent primarily on groundfish. The collapse of the groundfish stocks is illustrated in Fig. 5.4, with landings dropping from the 650,000 t range to just over 150,000 t in five years, and then to the 100,000 t range in more recent years. Over the same period, landings of the more valuable shellfish species have doubled. The impact on industry economics is evident from Fig. 5.5, which shows that landed value has increased by over 50% (in nominal terms) since 1990, with shellfish accounting for 85% of the total.

Figure 5.4: Atlantic commercial fisheries, quantity landed

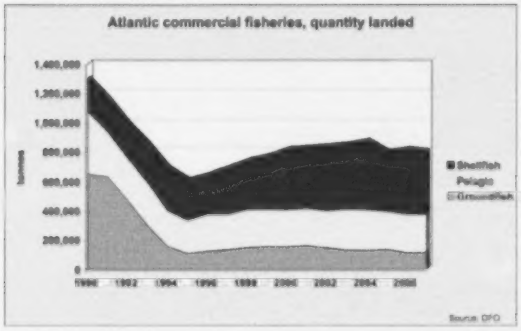
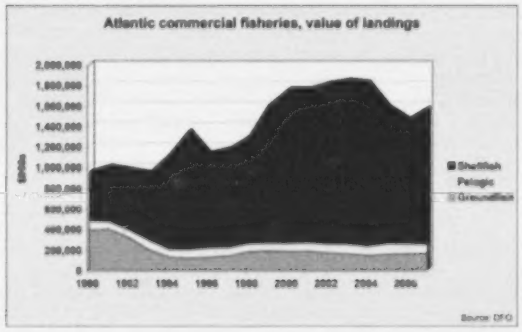


Figure 5.5: Atlantic commercial fisheries, value of landings



Aquaculture shows a steady increase in tonnage and value to 2007, with a slight drop in value 2007 in response largely to pressure on exchange rates (Fig. 5.6 and 5.7). Since 1990, production (quantity and value) have increased about 5-fold in response to rising demand and improved production methods.

Figure 5.6: Atlantic aquaculture quantity produced

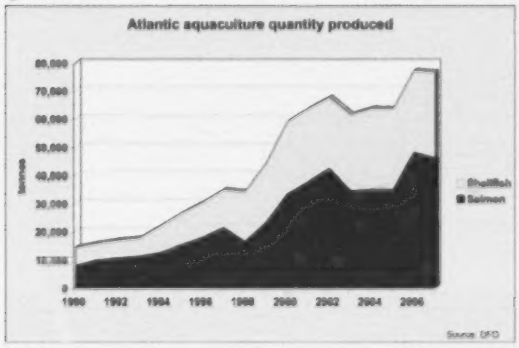
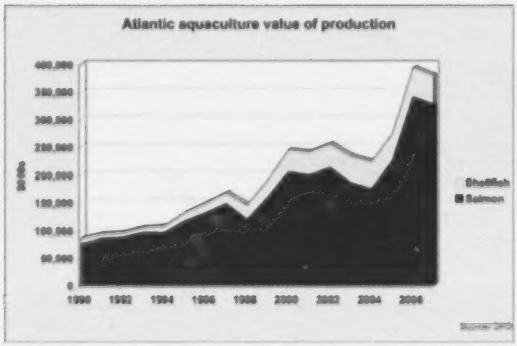


Figure 5.7: Atlantic aquaculture value of production



Through the early to mid-2000s, the final product value of the seafood sector (aquaculture and processing) approached $4.0 billion, though the trend has been one of decline with the total dropping to the $3.7 billion range in 2006 (Table 5.5). The rise in aquaculture production was not enough to offset the sharp drop in processed product value in 2005 due to weak markets for snow crab in the U.S.

Table 5.5: Seafood production, Atlantic Canada, 2003-2007

	Commercial fisheries Landings		Aquaculture Output		Processing Product	Seafood industry	Export Value
	tonnes	$000s	tonnes	$000s	$000s	$000s	$000s
2003	851,024	1,838,861	71,800	300,450	3,652,241	3,952,691	3,371,494
2004	875,540	1,867,209	72,735	285,000	3,538,071	3,823,071	2,965,049
2005	799,719	1,607,962	77,575	363,000	3,259,993	3,622,993	3,172,550
2006	818,544	1,501,372	81,464	467,565	3,234,566	3,702,131	2,965,593
2007	801,617	1,593,618	83,346	423,094	n.a.	n.a.	2,821,695

Source: DFO, http://www.dfo-mpo.gc.ca/stats-eng.htm; Statistics Canada, special tabulation
Statistics Canada, Cat. No. 301-0006

Offshore Oil & Gas Sector

Activity

Offshore oil & gas extraction activity is to date conducted only on the East Coast of Canada. Three crude oil projects have been developed and are in production on the Grand Banks off Newfoundland and Labrador, with another project in the planning stage. One natural gas project has been developed and is in production on the Scotia Shelf off Nova Scotia, with another project in the planning stage. Key statistics are shown in Table 5.6.

Table 5.6: Offshore oil & gas sector, operating costs and employment, 2006

	Extraction Operating		Support activities		
Projects	costs	Employment	Wells drilled	Cost	Employment
#	$ millions	FTE	#	$ millions	FTE
4	1,300	3,000	6	185	200

Source: CNLOPB/CNSOPB

Support services (exploration) activities consisted of six wells in 2006, all on the Grand Banks. A drilling program typically consists of a jack-up or semi-submersible rig, supported by supply and safety vessels, helicopters and a range of well finishing and testing services. Exploration activities on the Grand Banks have been fairly steady over the past decade, while disappointing results on the Scotia Shelf have led to a drop-off in exploration in that area.

Production

The Newfoundland and Labrador offshore produced 110 million barrels of crude oil in 2006, with a total value of $8.1 billion (Table 5.7). Production has increased in steps, starting with Hibernia in 1997 and followed by Terra Nova in 2002 and White Rose in 2007 (Fig. 5.8). Rising oil prices since 2002 account for the doubling in output value since 2004 (more than enough to offset the declining value of the U.S. dollar), with revenues rising to the $13.0 billion range in 2008 (Fig. 5.8).

Similar increases in natural gas prices served to push the Sable gas production value to $1.5 billion in 2005. The decline to just over $1.0 billion in 2006 was due to reduced production (geological factors caused a drop in pressure, which was remedied in 2007 with the installation of compression facilities), weaker prices and the reduced value of the U.S. dollar. Increased production coupled with higher natural gas prices pushed revenues to the $1.5 billion range in 2008 (Fig. 5.9).

Table 5.7: Offshore petroleum production, Atlantic Canada, 2002-2006

	Crude oil		Natural gas	
	million bbls	$ millions	bcf	$ millions
2002	104	4,082	193	827
2003	123	4,994	165	1,152
2004	115	5,681	153	1,096
2005	111	7,387	149	1,518
2006	110	8,108	134	1,014
2007	134	10,435	155	1,079
2008	125	12,917	164	1,462

Source: See Appendix A for derivation and sources

Figure 5.8: Atlantic Canada crude oil production, quantity and value

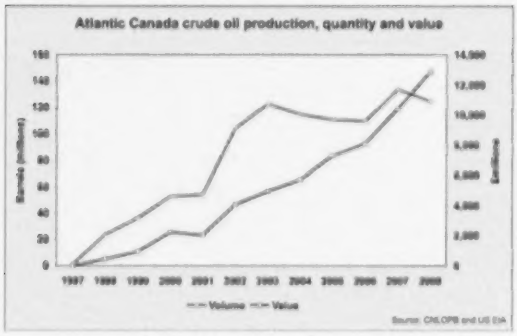
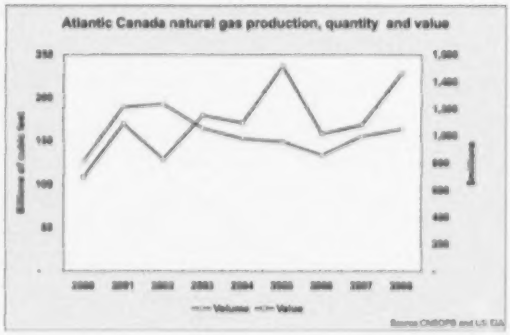


Figure 5.9: Atlantic Canada natural gas production, quantity and value



Marine Transportation Sector

Activity

Atlantic Canada has 60 commercial ports, nine larger ones managed by Canada Port Authorities and 51 regional or local ports administered by Transport Canada. Four main segments characterize the industry: bulk, container, ferry service and cruise ship.

- **Bulk:** several ports in the region handle international bulk cargoes including Québec City, Saint John, Halifax, Come-By-Chance and Port Hawkesbury (crude oil and refined products); Sept-Îles and Port Cartier (iron ore); Sydney, Belledune and Dalhousie (coal).
- **Container:** Montreal and Halifax are Canada's second and third largest container ports (after Vancouver), with both also handing a range of bulk products including wheat and gypsum. Montréal container traffic has steadily increased over the past 30 years, and the port is considering further expansion. St. John's also handles containers (domestic service), while a service to the Caribbean operates from the Port of Saint John.

- **Ferry service:** several services operate in the region, carrying over one million passengers and several hundred thousand cars and trucks. The main ones are North Sydney-Port Aux Basques and North Sydney-Argentia (integral components of the Newfoundland and Labrador supply chain); Yarmouth-Maine; Nova Scotia-PEI, Saint John-Digby and PEI-Madgalen Islands.
- **Cruise ship:** traffic has increased steadily over the past decade, with Halifax and Saint John ranking as the 3rd and 4th largest ports of call in Canada. Other ports include Sydney and Québec City.

Production

The marine component of the water transportation sector generated output valued at an estimated $1.9 billion in Atlantic Canada in 2005 (latest year for shipping data). The marine transportation segment accounted for $872 million, while support activities contributed an estimated $1,000 million (Table 5.8).

Table 5.8: Marine transportation sector production, Atlantic Canada, 2001-2005

	Vessel movements	Cargo		Water transportation revenues	Support activities revenues	Total revenues	Pilotage assignments
	#	000 t	% container		$millions		#
2001	-	-	8.6	615	707	1,322	30,406
2002	14,079	217,060	8.8	668	768	1,436	30,953
2003	14,324	248,323	8.1	728	837	1,565	32,509
2004	13,807	245,752	8.8	750	863	1,613	32,287
2005	16,273	257,472	8.4	823	946	1,769	33,887
2006	n.a.	n.a.	n.a.	872	1,003	1,875	n.a.

Source: Statistics Canada, Shipping in Canada 2005; Transport Canada, Transportation in Canada 2007
*2006 revenue data estimated from 2006 GDP using a 2005 GDP/Revenue ratio of .367.

Industry activity is characterized by a rising number of vessel movements and increased cargo tonnage. The figures reflect the importance of shipping in supporting Atlantic Canada's resource industries. Though not obvious from the data, the cargo tonnage also indicates increased container traffic (a steady percentage of an increasing tonnage), a reflection of the importance of the eastern Canadian ports (Montreal and Halifax) to European-North American trade.

Tourism and Recreation

Activity

Due largely to the scope and focus of data sources, tourism is broken down into three expenditure-driven areas for this analysis: marine recreational fishing, cruise ship travel, and coastal tourism/recreation including coastal travel by tourists, marine boating and beach recreational activities by local residents. In each case the activities tend to be seasonal, lasting 2-6 months in Atlantic Canada.

The data in Table 5.9 provide an overview of the key industry indicators, including average spending per trip or person that forms the basis of the impact estimates. With recreational fishing and coastal recreation, spending is on travel, accommodation, food, charters and equipment. Regretably, data for boating for years prior to 2006 are not available. A study was conducted in 2002 but differences in methodology suggest the results may not be comparable (see Appendix C for details). With cruise ship travel, impacts are driven by expenditures by passengers and crew at ports of call. Excluded from the spending figures in Table 5.9 is spending by cruise ships on port fees, fuel and provisions (these expenditures are captured by Water Transportation).

Table 5.9: Tourism and recreation activity, Atlantic Canada, 2006

Recreational fishing		Cruise ship		Coastal tourism	
Days	Avg spend/day	Passengers	Avg spend/passenger	Days	Avg spend/day
000s	$	000s	$	000s	$
950	123	486	118	24,634	40

Appendix C

Production

Marine tourism and recreation activities generated expenditures estimated at $1.6 billion in Atlantic Canada in 2006 (Table 5.10). Spending by tourists engaged in coastal activities accounts for almost 90% of total spending, followed by and recreational fishing at 7% and cruise ship travel at 3%.

Table 5.10: Tourism expenditures in Atlantic Canada, 2002-2006

			Coastal			
$millions	Recreational fishing	Cruise ship	Tourism	Recreation	Boating	Total
2002	148	61	940	164	n.a.	n.a.
2003	140	57	871	162	n.a.	n.a.
2004	132	71	870	160	n.a.	n.a.
2005	124	59	842	158	n.a.	n.a.
2006	116	57	818	156	444	1,591

Appendix C

Marine Construction

Activity

Marine construction consists of construction activity taking place in the marine environment. Two types of marine construction are included in this study: ports and harbours and offshore oil & gas development (installation of facilities). Quantifying the impact of marine construction draws on four distinct data sources:

- Port Authorities and port operators/users for construction of docks and facilities
- Fisheries and Oceans Canada for construction and maintenance of small craft harbours
- Department of National Defence for construction and maintenance of base facilities
- Oil & gas industry for offshore field development.

Production

The value of marine construction activity in Atlantic Canada declined from a high of $517 million in 2003 to about $250 million in 2006, with an average annual expenditure of $397 million (the figures in Table 5.11 are adjusted for inflation and expressed in 2005 dollars). Development of offshore oil & gas fields off Newfoundland and Labrador and Nova Scotia accounts for about two-thirds of the total, with completion of projects in this sector explaining the declining trend. Economic impacts are estimated using the 5-year average capital expenditures.

Table 5.11: Marine Construction in Atlantic Canada, 2002-2006

Expenditures in $000 (2005)	Ports	Small craft harbours	National Defence	Oil & gas	Total
2002	58,995	n.a.	61,442	316,815	n.a.
2003	50,773	26,027	69,499	369,957	516,254
2004	44,222	24,922	57,862	329,124	456,131
2005	45,902	21,525	55,830	204,750	328,007
2006	58,061	23,279	49,833	118,272	249,445
5-year avg.	51,590	23,938	58,893	267,784	309,967

Source: Appendix D

Shipbuilding and boat building

Activity

The ship and boat building industry has two components – Ship Building and Repairing and Boat Building – which combined generated revenues in the $620 million range in Atlantic Canada in 2006.

Atlantic Canada's ship and boat building industry consists of some 250 establishments. The few shipyards in the region conduct mainly repair and refit work on commercial, navy and Coast Guard vessels. The yards have enjoyed some success in building vessels for the navy and Coast Guard, but there is limited demand for new ships in Canada. Yards find it difficult to compete in international markets because of the degree of subsidization occurring in most countries.

The bulk of the new building occurs in boat yards, most of which specialize in fishing vessels. A few have also ventured into the recreational vessel market with good results. Both these markets are highly sensitive to underlying economic conditions. Good catches and rising prices in the early 2000s meant strong demand for fishing vessels. Demand diminished after 2006 in response to declining catches and weak markets. The outlook for both recreational and fishing vessels is poor in the economic climate of 2009.

Production

The ship and boat building industry generated output valued at an estimated $620 million in Atlantic Canada in 2006. The shipbuilding segment accounted for $285 million, while the boat building segment contributed an estimated $335 million (Table 5.12).

Table 5.12: Ship and boatbuilding (marine) production, Atlantic Canada, 2002-2006

	Ship building & repairing		Boatbuilding		Total	
	establishments	revenues	establishments	revenues	establishments	revenues
	#	$ millions	#	$ millions	#	$ millions
2002	-	433	-	325	-	758
2003	-	251	-	356	-	607
2004	80	304	420	371	500	675
2005	66	228	205	270	271	498
2006	61	285	191	335	252	619

Source: Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis33661este.html
Statistics Canada, special tabulation and Cat. No. 301-0006

Public Sector

Federal government

Six federal departments play a significant role in the Atlantic Region marine economy (Table 5.13):

- **National Defence** carries out its defence, maritime control and surveillance activities from naval and air bases in Nova Scotia, Newfoundland and Labrador and Québec, with support services at headquarters in Ottawa.
- **Fisheries and Oceans** carries out its fisheries, oceans and Coast Guard responsibilities from five regional centres in Atlantic Canada: St. John's, Halifax, Moncton and Québec City, with central support from headquarters in Ottawa.
- **Transport Canada** carries out its marine safety, security and management functions at several ports in eastern Canada and from its regional offices in Moncton and headquarters in Ottawa.
- **Natural Resources Canada** carries out its oceans related activities in the Atlantic Region from facilities at the Bedford Institute of Oceanography (Geological Survey of Canada – Atlantic) in Nova Scotia, with fieldwork conducted throughout the region and the eastern Arctic.
- **Canadian Food Inspection Agency** carries out its seafood inspection and monitoring work from several centres in the Atlantic region.
- **Environment Canada** carries out its work from Atlantic regional headquarters in Halifax, with offices in other major centres in the region.

Table 5.13: Public sector role in the ocean economy, Atlantic Canada, 2006

	Expenditures ($000s)	Employment (FTE)
Federal		
National Defence	1,643,120	13,195
Fisheries and Oceans	1,021,609	6,850
Transport Canada	36,700	500
Natural Resources Canada	24,000	80
Canadian Food Inspection Agency	9,600	112
Environment Canada	4,300	25
Sub-total federal	2,739,329	20,762
Provincial		
Seafood	30,250	n.a.
Offshore oil & gas	25,000	n.a.
Transportation (ferries)	19,550	n.a.
Tourism	19,275	n.a.
Sub-total provincial	94,075	
Universities	64,215	612
ENGOs	9,776	180
Total	2,907,395	n.a.

Source: Departments/Agency, special tabulations; Appendix F.
Note: Transport Canada expenditures are net of subsidies (see Table F-4).

Provincial governments

All five provincial governments in eastern Canada participate in the management and administration of at least some ocean activities; mainly fish processing and marine transportation, but also offshore oil & gas, tourism and environment. Expenditures are summarized in Table 5.13.

Atlantic region impact

Ocean sector activities generated an estimated $12.9 billion in direct GDP in Atlantic Canada in 2006, creating about 97,600 direct jobs (Table 5.14). Table 5.15 (next page) provides a summary of overall impacts.

The ocean sector accounted for 3.5% of Atlantic Canada GDP in 2006. In creating 97,600 direct jobs, the ocean sector accounted for 2.0% of total Atlantic Canadian employment (Table 5.14).

When the scope of ocean sector activities is broadened to include spin-off impacts (indirect and induced activities), the relative importance of the ocean sector increases to 5.0% of regional GDP and 3.7% of total employment.

Table 5.14: Ocean activity in the Atlantic Canada economy, 2006

	Ocean sector impact	Atlantic Canada total	Ocean as % of total
GDP ($ millions)			
Direct	12,923		3.5%
Direct plus spinoff	18,430		5.0%
		369,398	
Employment (FTE)			
Direct	97,619		2.0%
Direct plus spinoff	175,790		3.7%
		4,782,245	

Source: Totals from Statistics Canada, Cat. No. 384-0002; 2006 Census.

The relative impact of ocean activities in the regional economy is three times higher than at the national level. This should not be surprising since most of the activity occurs in the smaller regional economy. Nonetheless, readers should note that recent studies in Newfoundland and Labrador and in Nova Scotia found that marine activities accounted for substantially higher shares of provincial totals than those appearing in Table 5.14 (e.g., 40% of provincial GDP in Newfoundland and Labrador and 15% of provincial GDP in Nova Scotia).* Though much of the same data used in those studies forms the basis of the impacts in this report, the difference in the relative impacts is explained by the much larger regional economy (including Québec) that forms the context of this study.

* Department of Finance, Economic Research and Analysis Division, *Estimating the Value of Marine, Coastal and Ocean Resources of Newfoundland and Labrador for the 2001-2004 Period*, 2006; Gardner Pinfold, *Economic Value of the Ocean Sector in Nova Scotia, 2002-2006*.

Table 5.15: Economic impact of ocean activities, Atlantic Canada, 2006

Output, GDP and Income in $000s Employment in full-time equivalent	Output	Direct			Indirect			Induced			Total		
		GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income
Private Sector													
Seafood													
Commercial fishing	1,501,372	786,352	9,621	540,589	169,864	2,758	87,827	236,272	3,109	173,386	1,192,488	15,487	801,802
Aquaculture	467,565	173,594	2,511	70,549	76,419	1,194	38,309	58,297	957	30,014	308,311	4,662	138,872
Fish processing	3,234,566	712,656	18,606	526,772	479,158	6,906	174,825	222,756	4,517	139,095	1,414,570	30,028	840,692
Offshore oil & gas													
Oil & gas exploration/extraction	9,121,886	7,753,603	3,334	227,039	952,713	2,800	115,558	435,316	1,365	63,252	9,141,632	7,498	405,850
Support activities for oil & gas	186,000	85,560	488	35,340	35,340	271	13,020	26,598	160	11,160	147,498	919	59,520
Transportation													
Marine transportation	872,600	351,840	5,146	272,330	115,078	1,971	77,916	131,346	2,029	108,450	598,264	9,146	458,696
Support activities	1,003,000	534,961	10,140	413,830	236,060	2,909	101,090	221,745	3,725	157,904	992,766	16,773	672,824
Tourism & recreation	1,590,981	710,163	18,547	488,090	476,391	11,603	426,826	336,388	8,904	285,209	1,522,942	39,054	1,200,124
Manufacturing & construction													
Shipbuilding and boat building	620,000	265,310	6,604	275,070	80,800	2,313	77,450	100,527	2,873	119,505	446,637	11,790	472,025
Oil & gas facilities construction	267,785	125,607	841	65,926	47,193	423	16,067	41,282	285	21,417	214,082	1,549	103,409
Ports and harbours construction	134,422	53,769	790	34,950	26,884	923	33,425	22,157	467	20,271	102,810	2,180	88,646
Sub-total private sector (1)	17,498,805	11,553,415	76,626	2,950,484	2,695,900	34,071	1,162,314	1,832,685	28,389	1,129,661	16,082,001	139,086	5,242,459
Public sector													
National Defence	1,643,200	774,438	12,919	774,438	227,202	5,754	229,764	279,711	5,286	301,676	1,281,351	23,959	1,305,878
Stewardship													
Fisheries & Oceans	1,041,912	444,109	6,378	444,109	206,951	1,098	63,931	187,322	2,205	159,087	838,382	9,681	667,127
Other federal departments	74,600	49,593	487	49,593	10,302	219	8,470	14,822	204	13,781	74,716	910	71,843
Provincial departments	94,080	49,089	433	49,089	10,825	357	11,565	14,521	202	8,328	74,434	992	68,982
Universities	64,215	45,322	600	35,366	9,577	149	4,020	13,037	172	10,454	67,936	921	49,840
ENGOs	9,776	7,440	176	6,484	1,080	18	458	2,199	48	1,938	10,719	242	8,880
Sub-total public sector (2)	2,910,223	1,369,991	20,993	1,359,078	465,937	7,595	318,208	511,611	8,116	495,264	2,347,540	36,704	2,172,550
Total	20,409,028	12,923,406	97,619	4,309,562	3,161,838	41,666	1,480,522	2,344,296	36,505	1,624,925	18,429,540	175,790	7,415,009

1. Sub-total of output value excludes commercial fishing because the value of fisheries output is included in fish processing.

2. Sub-total of output excludes provincial transportation subsidies (provincial ferries) because these are included in marine transportation revenues.

3. Employment impact is adjusted for the increase in the industrial wage index (2.1% from July 2005 to July 2006. Source: Statistics Canada, Table 281-0039).

4. Indirect and induced impacts of fish processing are adjusted to eliminate double counting of commercial fishing activity.

3. Pacific region impacts

Seafood Sector

Activity

- **The commercial fishing industry** is composed of some 2,000 mainly independent fishing vessels (Table 5.16) employing about 8,000 (skippers and crew). Groundfish (halibut & redfish), salmon, clam, crab and shrimp are the main species. Generally, the industry has been in steady decline over the past 20 years, with key species such as salmon and clam at a fraction of their earlier levels.

Table 5.16: Seafood sector structure, Pacific Canada, 2006

Commercial fisheries		Aquaculture		Processing	
Vessels	Jobs	Sites	Jobs	Plants	Jobs
2,000	~8000	586	2,100	242	3,700

Source: BC Ministry of Environment, *BC Seafood Industry Year in Review, 2007*

- **The aquaculture industry** is composed of 586 sites, creating some 2,100 jobs. Atlantic Salmon accounts for 95% of production value, with oyster and clam making up most of the balance.

- **The seafood processing industry** consists of 242 establishments, employing some 3,700 workers. Plants handle fish from the capture fisheries as well as the aquaculture sector.

Production

Over the past decade, Pacific Canada's commercial fisheries have typically produced 200-250,000 tonnes (landed weight) of raw material annually, with a value in the $300-350 million range (Table 5.17). This is down from the early 1990s when landings were in the 300,000 t range, with landed value of $400 million or more. Figures 5.10 and 5.11 show that the drop in tonnage and value from the early 1990s is accounted for mainly by declining salmon stocks. Reduced groundfish landings have contributed to the slight decline since 2004.

Figure 5.10: Pacific commercial fisheries quantity landed

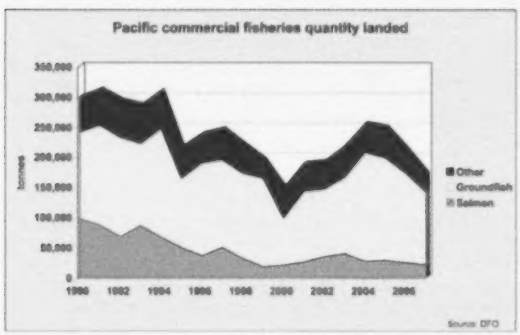
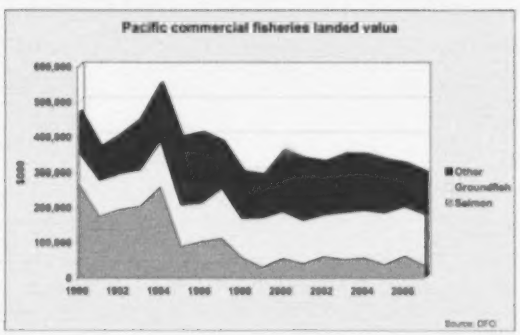


Figure 5.11: Pacific commercial fisheries landed value



Aquaculture shows a substantial increase in tonnage and value to 2002, followed by a sharp drop in tonnage and value to 2004 (attributable to weak markets and pressure on exchange rates), and then a return to strong growth up to 2006 (Figures 5.12 and 5.13). Output value has increased from a few million dollars in 1990 to over $400 million in 2006. Atlantic salmon accounts for over 95% of product value.

Figure 5.12: Pacific aquaculture quantity produced

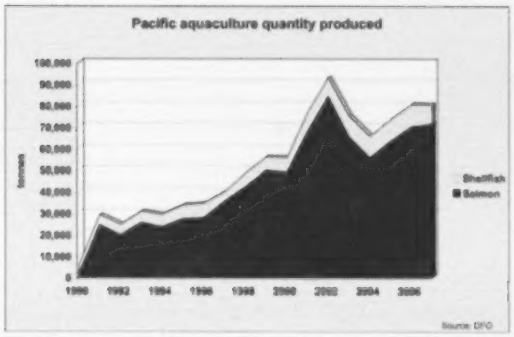
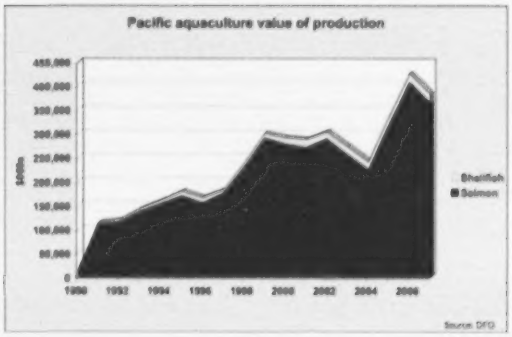


Figure 5.13: Pacific aquaculture value of production



Through the early to mid-2000s, the final product value of the seafood sector exceeded $775 million, with a decline in 2006 to the $727 million range (Table 5.17).

Table 5.17: Seafood production, Pacific Canada, 2003-2007

	Commercial fisheries Landings		Aquaculture Output		Processing Product	Seafood industry	Export Value
	tonnes	$000s	tonnes	$000s	$000s	$000s	$000s
2003	217,658	346,522	75,126	273,531	649,085	922,616	996,791
2004	254,720	346,219	65,666	241,828	775,539	1,017,367	986,723
2005	248,440	330,022	73,624	337,158	719,912	1,057,070	995,607
2006	211,497	318,909	80,609	427,466	727,739	1,155,205	986,886
2007	171,011	293,925	80,430	364,400	n.a	n.a.	904,899

Source: DFO, http://www.dfo-mpo.gc.ca/stats-eng.htm; Statistics Canada, special tabulation
Statistics Canada, Cat. No. 301-0006

Offshore Oil & Gas Sector

Federal and provincial moratoria, in place since 1972, prohibit offshore oil and gas exploration off the coast of British Columbia. Though the Geological Survey of Canada in its most recent (1988) report suggests substantial quantities of recoverable reserves of crude oil and natural gas may exist, any economic impact from their development (and figures from Atlantic Canada indicate this could be substantial) would be contingent on lifting these moratoria.

Marine Transportation Sector

Activity

The Pacific coast has 21 commercial ports, six larger ones managed by Canada Port Authorities and 15 regional or local ports administered by Transport Canada. The marine transportation industry is composed of three main segments: bulk, container and ferry service (the NAICS definition excludes cruise ship travel because it involves not transportation from one port to another, but embarking and disembarking at the same location; for purposes of this study, the impact of the cruise industry is captured under tourism).

- **Bulk:** several Pacific coast ports handle bulk cargo including Port Metro Vancouver (coal, sulfur, forest products and automobiles), Prince Rupert (coal and grain), and Nanaimo and Port Alberni (forest products).
- **Container:** Vancouver is Canada's largest container port with four terminals (Fraser, Deltaport, Centerm and Vanterm). A new container terminal opened in Prince Rupert in late 2007, aimed at picking up Asia-NorthAmerica traffic and alleviating congestion in other west coast ports.
- **Ferry service:** BC Ferries, with 36 vessels operating on 25 routes (and 47 terminals), is the largest ferry operator in the world by number of vessels. In 2005 it handled 21.7 million passengers and 8.5 million vehicles. Four new ferries are entering service or are on order (none being built in Canadian shipyards).

Production

Marine transportation generated output valued at an estimated $4.4 billion in the Pacific region in 2006. Container cargo accounts for 16% of total tonnage, about double the Canadian average. This reflects the increasing importance of the west coast as a point of entry for manufactured products from the Far East. Shipping and ferries accounted for $1.9 billion in revenue, while support activities contributed an estimated $2.5 billion (Table 5.18).

Table 5.18: Marine transportation production, Pacific region, 2001-2005

	Vessel movements	Cargo		Water transportation revenues	Support activities revenues	Total revenues	Pilotage assignments
	#	000 t	% container		$millions		#
2001	-	-	12.0	1,406	1,828	3,234	13,435
2002	20,748	112,893	14.9	1,523	1,980	3,503	12,655
2003	21,425	118,377	16.3	1,641	2,133	3,774	12,952
2004	21,645	127,750	16.9	1,659	2,157	3,816	13,002
2005	21,491	133,055	16.5	1,803	2,344	4,147	13,219
2006	n.a.	n.a.	n.a.	1,911	2,484	4,395	n.a.

Source: Statistics Canada, Shipping in Canada 2005; Transport Canada, Transportation in Canada 2007
*2006 revenue data estimated from 2006 GDP using a 2005 GDP/Revenue ratio of .367.

Tourism and Recreation

Activity

Tourism is broken down into three expenditure-driven areas for this analysis: marine recreational fishing, cruise ship travel, and coastal tourism in the form of water-based recreational activities.

The data in Table 5.19 provide an overview of the key industry indicators, including average spending per trip or person that forms the basis of the impact estimates. With recreational fishing and coastal recreation, spending is on travel, accommodation, food, charters and equipment. Boating is included under coastal tourism/recreation, though due to limitations with the data, neither trips nor average expenditures/trip are available and are not included in Table 5.19. Estimated expenditures for boating are included under coastal tourism/recreation in Table 20.

With cruise ship travel, impacts are driven by expenditures by passengers and crew at ports of call. Excluded in the average spending figure in Table 5.19 is spending by cruise ships on port fees, fuel and provisions.

Table 5.19: Tourism and recreation activity, Pacific, 2006

Recreational fishing		Cruise ship		Coastal tourism/recreation	
Days	Avg spend/day	Passengers	Avg spend/passenger	Days	Avg spend/day
000s	$	000s	$	000s	$
2,260	292	1,263	323	11,643	64

Appendix C

Production

Marine tourism activity makes a major contribution to the Pacific ocean economy, generating expenditures estimated at $2.7 billion in 2006 (Table 5.20). Cruising has been a major growth industry, with Vancouver (a home port) and Victoria placing first and second among Canada's cruise ship ports. Prince Rupert is also an important port of call on the increasingly popular cruises to Alaska. Spending by tourists engaged in recreational fishing has also increased. Coastal tourism and recreation are the largest sources of impact, accounting for 60% of total expenditures. Regretably, data for boating for years prior to 2006 are not available. A study was conducted in 2002 but differences in methodology suggest the results may not be comparable (see Appendix C for details).

Table 5.20: Tourism expenditures in Pacific region, 2002-2006

	Recreational		Coastal			
$millions	fishing	Cruise ship	Tourism	Recreation	Boating	Total
2002	545	258	682	57	n.a.	n.a.
2003	574	268	615	57	n.a.	n.a.
2004	604	328	632	57	n.a.	n.a.
2005	633	373	661	57	n.a.	n.a.
2006	662	408	691	57	926	2,744

Appendix C

Marine Construction

Activity

This activity consists of port and harbour construction. There has been no offshore oil & gas development.

Quantifying the impact of marine construction draws on four data sources:

- Port Authorities and port operators/users for construction of works including docks and cargo/passenger handling facilities
- Fisheries and Oceans Canada for construction and maintenance of small craft harbours
- Department of National Defence for construction and maintenance of naval bases and facilities
- BC Ferries for construction of terminal facilities

Production

The value of marine construction activity in the Pacific region almost doubled over the period, rising from just under $100 million in 2002 to $190.7 million in 2005, with an average expenditure of $132.6 million (the figures in Table 5.21 are adjusted for inflation and expressed in 2005 dollars). Port development at Prince Rupert (a new container terminal) and expansion in Vancouver account for two-thirds of total expenditures. Economic impacts are estimated using the 5-year average capital expenditures.

Table 5.21: Marine Construction in the Pacific region, 2002-2006

Expenditures in $000s	Ports	Small craft harbours	National Defence	BC Ferries	Total
2002	36,440	n.a.	21,077	39,378	n.a.
2003	18,865	2,750	9,533	39,574	70,721
2004	39,069	3,009	15,197	73,630	130,906
2005	44,834	3,569	41,289	101,000	190,692
2006	81,502	4,225	38,701	45,806	170,234
5-year avg.	44,142	3,388	25,159	59,878	132,567

Source: Appendix D

Shipbuilding and boat building

Activity

The ship and boat building industry has two components – Ship Building and Repairing and Boat Building – which combined generated revenues in the $450 million range in the Pacific region in 2006.

The BC ship and boat building industry consists of some 330 establishments. Among these are four major shipbuilders: Victoria and Vancouver Shipyards (part of the Washington Marine Group), Allied Shipbuilders in Vancouver and the Nanaimo Shipyard Group. The Victoria Shipyard completed construction of eight navy training vessels in 2008, but otherwise, the yards are occupied mainly with repairs, refits and conversions for DND, Coast Guard and BC Ferries. BC's boat yards, which make up the bulk of the industry, specialize in pleasure craft and fishing vessels, and most are relatively small operations.

Production

The ship and boat building industry generated output valued at $446 million in the Pacific region in 2006. The shipbuilding segment accounted for $237 million, while the boat building segment contributed $209 million (Table 5.22).

Table 5.22: Ship and boatbuilding (marine) production, Pacific, 2002-2006

	Ship building & repairing		Boatbuilding		Total	
	establishments	revenues	establishments	revenues	establishments	revenues
	#	$ millions	#	$ millions	#	$ millions
2002	-	175	-	225	-	400
2003	-	217	-	228	-	445
2004	111	213	245	181	356	394
2005	53	222	251	191	304	413
2006	74	237	259	209	333	446

Source: Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis3366leste.html
Statistics Canada, special tabulation and Cat. No. 301-0006

Public Sector

Federal government

Six federal departments play a significant role in the Pacific Region ocean economy (Table 5.22):

- **National Defence** carries out its defence, maritime control and surveillance activities from naval and air bases in Esquimalt and Comox.
- **Fisheries and Oceans** carries out its fisheries, oceans and Coast Guard responsibilities from its regional headquarters in Vancouver and from 25 coastal offices, including Victoria where the Coast Guard is based.
- **Transport Canada** carries out its marine safety, security and management functions at several ports in the province and from its regional offices in Vancouver.
- **Natural Resources Canada** carries out its oceans related activities in the Pacific region from facilities at the Pacific Geoscience Centre (Geological Survey of Canada – Pacific Division), with fieldwork conducted along the west coast.
- **Canadian Food Inspection Agency** carries out its seafood inspection and monitoring work from several centres in BC.
- **Environment Canada** carries out its programs from Pacific regional headquarters in Vancouver.

Provincial government

The BC government participates in the management and administration of several ocean activities; mainly ferries, aquaculture and fish processing, tourism and environment. Expenditures are summarized in Table 5.23. Subsidies to the BC ferry system are not included in the expenditures used to estimate economic impact.

Table 5.23: Public sector role in the ocean economy, Pacific, 2006

	Expenditures ($000s)	Employment (FTE)
Federal		
National Defence	550,225	7,675
Fisheries and Oceans	302,648	2,365
Transport Canada	13,100	175
Natural Resources Canada	2,000	30
Canadian Food Inspection Agency	2,750	40
Environment Canada	6,000	26
Sub-total federal	876,723	10,311
Provincial		
Transportation (ferries)	108,400	n.a.
Seafood	10,000	n.a.
Tourism	16,420	n.a.
Other	21,000	n.a.
Sub-total provincial	155,820	
Universities	41,200	470
ENGOs	36,600	510
Total	1,032,543	n.a.

Source: Departments/Agency, special tabulations; Appendix F.
Note: Transport Canada expenditures are net of subsidies (see Table F-4).

Pacific region impact

Ocean sector activities generated an estimated $4.8 billion in direct GDP in the Pacific region in 2006, creating over 73,600 direct jobs. Table 5.24 provides a summary of overall impacts, with impacts by activity set out in Table 5.25.

The ocean sector accounted for 2.6% of British Columbia GDP in 2006. In creating over 73,600 direct jobs, the ocean sector accounted for 3.5% of total British Columbia employment (Table 5.24).

When the scope of ocean sector activities is broadened to include spin-off impacts (indirect and induced activities), the relative importance of the ocean sector increases to 5.0% of provincial GDP and 6.7% of total employment.

Table 5.24: Ocean activity in the Pacific region economy, 2006

	Ocean sector impact	British Columbia total	Ocean as % of total
GDP ($ millions)			
Direct	4,761		2.6%
Direct plus spinoff	9,221		5.0%
		182,743	
Employment (FTE)			
Direct	73,646		3.5%
Direct plus spinoff	140,204		6.7%
		2,092,765	

Source: Totals from Statistics Canada, Cat. No. 384-0002; 2006 Census.

The overall value of output and impact results in Table 5.25 are 17% lower than the estimates in a 2007 study of the economic impact of ocean activities in British Columbia.* The major differences between the findings arise mainly from differences in the scope of what is included in the respective studies. Differences in the output values for certain activities and the size of the multipliers used to estimate impacts contribute to the differences in a minor way.

- **Scope**: the GSGislason report includes two activities – the marine component of forestry (an example of "own-account" water transportation) and Ocean High Tech manufacturing – not included in this study. Combined, they account for two-thirds of the difference in overall output value and GDP impact.
- **Output value**: the estimated value of ocean tourism (recreation) is 20% higher in the Gislason study (Gislason: $3.3 billion vs. this report: $2.7 billion). This is more than offset by the difference in water transportation (Gislason study: $3.6 billion vs. this report: $4.4 billion). Since tourism and water transportation combined account for at least 60% of the direct GDP impact in both studies, the refinement of the methods used to estimate output value of these activities is essential. The estimates of output value of all other activities are comparable.
- **Multipliers**: the multipliers account for a small difference in the impacts. The indirect GDP impact adds 24% to the direct impact in the Gislason study; it adds 21% in this study. The induced GDP impact adds about 30% to direct and indirect impacts in both studies. These differences would be accounted for in part by the different I-O model versions used (2003 vs. 2005).

* GSGislason & Associates, *Economic Contribution of the Oceans Sector in British Columbia*, 2007.

Table 5.25: Economic impact of ocean activities, Pacific, 2006

Output, GDP and Income in $000s Employment in full-time equivalent	Output	Direct			Indirect			Induced			Total		
		GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income
Private Sector													
Seafood													
Commercial fishing	318,909	143,509	434	82,916	51,025	656	31,891	66,142	338	40,183	260,676	1,428	154,990
Aquaculture	427,466	115,416	1,662	51,296	128,240	1,742	64,120	82,843	1,055	40,396	326,499	4,459	155,811
Fish processing	727,739	219,777	4,362	123,716	87,329	958	39,298	74,526	1,108	39,735	381,632	6,428	202,748
Offshore oil & gas													
Oil & gas exploration/extraction													
Support activities for oil & gas													
Transportation													
Marine transportation	1,911,000	859,950	9,358	573,300	382,200	4,661	210,210	422,331	4,346	274,229	1,664,481	18,365	1,057,739
Support activities	2,484,000	1,291,680	16,933	794,880	397,440	8,807	298,080	574,301	7,979	382,536	2,263,421	33,720	1,475,496
Tourism & recreation	2,743,930	1,179,890	26,875	960,376	823,179	13,437	493,907	681,043	12,497	508,999	2,684,112	52,809	1,963,282
Manufacturing & construction													
Shipbuilding and boat building	446,000	197,080	2,340	111,650	69,270	924	38,050	90,559	1,012	52,395	356,909	4,276	202,095
Oil & gas facilities construction													
Ports and harbours construction	132,567	53,027	779	34,467	39,770	649	23,862	31,551	443	20,415	124,348	1,871	78,745
Sub-total private sector (1)	8,872,702	4,060,329	62,744	2,732,601	1,978,453	31,834	1,199,418	2,023,296	28,778	1,358,886	8,062,078	123,356	5,290,905
Public sector													
National Defence	550,225	451,185	7,494	451,185	55,023	970	33,014	172,110	2,624	169,469	678,317	11,087	653,667
Stewardship													
Fisheries & Oceans	302,648	142,245	2,122	142,245	87,768	400	21,185	78,204	782	57,200	308,217	3,305	220,630
Other federal departments	23,850	15,503	164	15,503	4,293	72	2,385	6,730	73	4,591	26,526	308	22,479
Provincial departments	155,780	33,166	163	33,166	7,107	392	12,319	13,693	172	7,462	53,966	726	52,947
Universities	41,200	30,488	461	23,896	6,180	72	2,060	12,467	165	9,085	49,135	699	35,041
ENGOs	36,600	28,182	498	24,522	3,660	53	1,830	10,826	171	9,223	42,668	722	35,575
Sub-total public sector (2)	1,007,323	700,768	10,901	690,516	164,030	1,959	72,793	294,031	3,987	257,031	1,158,829	16,848	1,020,339
Total	9,880,025	4,761,096	73,646	3,423,116	2,142,483	33,793	1,272,211	2,317,327	32,765	1,615,918	9,220,907	140,204	6,311,245

1. Sub-total of output value excludes commercial fishing because the value of fisheries output is included in fish processing.

2. Sub-total of output excludes provincial transportation subsidies (provincial ferries) because these are included in marine transportation revenues.

3. Employment impact is adjusted for the increase in the industrial wage index (2.1% from July 2005 to July 2006. Source: Statistics Canada, Table 281-0039).

4. Indirect and induced impacts of fish processing are adjusted to eliminate double counting of commercial fishing activity.

4. Arctic region impacts

Seafood sector

Central and Arctic Region of DFO manages fisheries in the Arctic. This group works co-operatively with the government of NWT, Nunavut and Nunavik. The primary fisheries of the region are northern shrimp, turbot and char. Several other species have been researched, and may offer commercial fishing opportunity in the future including clam, starry flounder, scallops and sea cucumbers.

The Nunavut Wildlife Management Board (NWMB) allocates Arctic resources in Nunavut. The NWMB takes its direction from the Nunavut Land Claims Agreement and carries out its duties as an independent body. This board receives applications from community and corporate interests and makes annual allocations after committee and public consultations. Most of these resources are allocated to Hunter Trapper Organizations (HTO) representing communities, and the Baffin Fisheries Coalition and Qikitarjuaq Corporation.

The Arctic region comprises 64% of Canada's marine waters, but provides a small portion of the commercial harvest. This region includes all marine waters north of the NAFO 0B/2G boundary in the east and to the Beaufort Sea in the west. Commercial marine harvesting is carried out only in Hudson Strait east, in the eastern portion of the region. The marine fishery focuses on two species: northern shrimp and turbot (Greenland halibut).
The shrimp fishery targets northern shrimp, with striped shrimp taken as a by-catch. Northern shrimp stock in the region are not fully utilized due to harsh conditions in the remote area, small shrimp size and lower catch rates than in other areas.

Fishing companies based in eastern Canada, including members from the Canadian Association of Prawn Producers (CAPP) and the Northern Alliance, conduct the fisheries for northern shrimp in the eastern Arctic. These companies fish under their own licences, as well as under co-ownership and royalty lease arrangements with Nunavut and Nunavik interests. In total, 12-13 factory trawlers participate in the Arctic shrimp fisheries. Catches from Artic waters are landed in Newfoundland and Labrador or Nova Scotia.

Turbot resources are harvested mainly with the factory trawlers used for shrimp. The offshore quota was 12,409 MT in 2007 and was harvested at 92%. This stock appears stable, though scientific information regarding recruits is uncertain. There is a small winter ice fishery for turbot in Cumberland Sound. The inshore fishery has an experimental quota of 500 MT. There is a recommendation to convert this to a commercial fishery. The harvest levels vary significantly each year depending upon ice conditions.

There are five processing plants in the Arctic, one in the NWT and four in Nunavut. The Nunavut plants currently employ 56 people, down from 94 in 2003. These plants process char and turbot, much of which is sold within the territory. Output in 2006 was valued at about $5.0 million.

These Arctic fisheries, though conducted primarily by southern companies, nonetheless make an important contribution to the regional economy in two ways: through royalty payments to Arctic interests holding shrimp licences, and also through employment of Innu and Inuit on the vessels (one of the terms of the agreements with licence-holders). Three northern companies, Qikiqtaaluk Corporation (Nunavut), Makivik Corporation (Nunavik) and Unaaq Fisheries (jointly owned by Qikiqtaaluk and Makivik), are provided equal shares of the northern shrimp quota. They negotiate

a royalty (typically 8-10% of the landed value) with the companies who fish the licence. Though royalty amounts are not a matter of public record, these three arrangements are estimated to have generated $2-3 million in the past few years (this is down from earlier years due to declining shrimp prices). The incomes earned by the 50-60 northern crewmembers would add another $2.5 million, bringing total income to $5-6 million.

Offshore Oil & Gas Sector

Despite considerable exploration work since the early 1970s (seismic testing and drilling) and some significant discoveries, there has been no development of offshore oil and gas discoveries in the Beaufort Sea and eastern Arctic. Several factors help to explain this, including the need for land claims settlements, moratorium on development, hostile environment and high development costs, the lack of major discoveries that would justify the cost of developing a transportation system, and low energy prices.

Rising energy prices and dwindling reserves in southern areas have provided an impetus for renewed interest in Arctic resources. In 2007, the federal government awarded an exploration licence in the Beaufort Sea with a work commitment of $585 million. In 2008, the federal government's lease auction for parcels in the Beaufort Sea generated a bid of $1.18 billion. Each bid contains minimum work requirements ($146 million in the case of 2007 bid, and $300 million in the case of the 2008 bid).

When these work commitments will be carried out and what impact the expenditures will have on northern communities is difficult to predict (the companies have five years to complete the work), but northern leaders are optimistic that the work will result in a major boost to local economies in Inuvik and Tuktoyaktuk.

Marine Transportation Sector

Most shipping activity in the Arctic is related to re-supply. Statistics Canada provides no data on shipping costs or revenues, or contribution to regional GDP.

In 2005, there were 21 domestic cargo vessel movements in the North West Territories. There were no international vessel movements. In Nunavut, there were 154 cargo vessel movements in 2005. Of these, 28 took place in Frobisher Bay/Iqualuit. The region has no port facilities. Marine vessels must anchor offshore and unload their cargoes onto barges, which are dragged above the high water mark to the beach for unloading. The shipping season runs from July to October.

In summer 2008, three trial shipments of iron ore were made from the Baffinland project in Milne Inlet, Baffin Island, to Vlissingen, Netherlands. These shipments could increase in the future.

In the western Arctic, two companies provide shipping on the Mackenzie River. Cooper Barging, provides about nine barge trips per annum serving Fort Simpson, Tulita and Norman Wells. Northern Transportation Company Ltd. (NTCL), serves a 5,000 km route from Hay River to the Mackenzie Delta. Its 12 tugs and 90 barges made 16 trips in 2007, moving about 90,000 tonnes of goods. The NTCL is managed and owned by the Inuvialuit Development Corporation and services northern communities with a tug and barge fleet. Most company activities are marine-based, but some operations are in freshwater and some marketing and regional offices expenditures are outside the region in Anchorage, Alaska, Calgary, Alberta, and Halifax, Nova Scotia.

Any increase in exploration or development of offshore oil and gas fields in the Beaufort Sea will increase shipping traffic, particularly for supply boats in this region.

Tourism and Recreation

Although local expenditure data for the cruise industry is not readily available, there has been a significant growth in northern cruise activity. The expedition cruise market in Labrador and the Arctic has been evolving over the past 15-20 years, and has gained considerable momentum in the past 3-4 years. Several companies, including Quark Expeditions, Cruise North, Adventure Canada, Polar Star Cruises and Quest Nature Tours, offer Arctic cruises.

Quark Expeditions is the largest polar expedition cruise operator in the world. They operate all polar cruises in the Arctic and Antarctic. Current Arctic itineraries include: Murmansk-North Pole; North West Passage (Provideniya-Resolute); Tanquary Fjord (Resolute-Tanquary Fjord); Arctic Adventure (Resolute-Nares Strait-Kangerlussuaq); Greenland Odyssey (Kangerlussuaq-Peary Land).

Cruise North is a five-year old venture owned by Makivik Corporation, which is also involved in First Air, Air Inuit and NEAS, amongst other interests. It operates entirely in Canadian waters, with a foreign-flag vessel imported on a seasonal basis. Most of its operations are based in Kuujjuaq, Quebec, in Ungava Bay. In 2007, it offered 10 departures, starting in mid-June from St. John's, and finishing in Kuujjuaq in early September. Other mid-summer itineraries include Kuujjuaq to Iqaluit, Iqaluit to Kuujjuaq, Churchill to Iqaluit and Iqaluit to Kuujjuaq.
In addition to Arctic cruises, surveys (Travel Survey of Residents of Canada and International Travel Survey) indicate modest levels of coastal tourism and recreational fishing (though overlap exists with reported subsistence fishing). No data on expenditures related to cruise travel are available, but coastal tourism and recreational fishing generate expenditures estimated at $2.5 million. Tables 5.26 and 5.27 set out trip and expenditure data.

Table 5.26: Marine tourism and recreational fishing activity, Arctic, 2006

Recreational fishing		Coastal tourism	
trips	Avg spend/trip	trips	Avg spend/trip
000s	$	000s	$
4.1	212	4.8	354

Sources: DFO, *Survey of Recreational Fishing in Canada*;
Statistics Canada, Travel Survey of Residents of Canada, 2007

Table 5.27: Marine tourism expenditures, Arctic, 2002-2006

$millions	Recreational fishing	Coastal tourism*	Total
2002	793,090	1,137,872	1,930,962
2003	812,769	1,132,838	1,945,607
2004	832,449	1,225,340	2,057,789
2005	852,128	1,216,273	2,068,401
2006	871,807	1,684,298	2,556,105

*Includes Nunavut only up to 2005; no data for NWT before 2006
Sources: DFO, *Survey of Recreational Fishing in Canada*;
Statistics Canada, *Travel Survey of Residents of Canada*, 2007

Marine Construction and Manufacturing

No significant construction activity is reported. Statistics Canada reports contain no data on enterprises engaged in shipbuilding or boat building.

Marine-related arts and crafts

A significant portion of NWT and Nunavut arts and crafts can be considered marine-based or marine-inspired. These include many carvings, animal skin products, prints and hangings. After costs, this sector is estimated to provide approximately $14 million in direct benefits (GDP) to the Arctic Region. (GSGislason and Associates, 2003).

Public Sector

Federal government

Although several federal departments have responsibilities related to the Arctic and its inhabitants, most marine programs are administered from other regions of Canada. Four federal departments have a significant presence in the Arctic marine economy (Table 5.28):

- Fisheries and Oceans carries out oceans and Coast Guard responsibilities with up to 50 staff posted in northern communities. The most significant work focuses on management and research related to the Beaufort Sea LOMA including its species, their habitats, and interacting human activities.
- Indian and Northern Affairs Canada is engaged in marine activities through its responsibilities related to: offshore energy and minerals development, northern contaminants research, climate change and adaptation research, and other ocean-based environmental research. Although it has many staff in the north, only 5-10 appear to have marine involvement.
- Natural Resources Canada provides geosciences and mapping support for the Arctic region and at most one FTE would be positioned in the north.
- Environment Canada also has a presence in the north with at most one local FTE responsible for trans-boundary water issues.

Territorial and First Nations government

The NWT and Nunavut governments have marine-related responsibilities in several departments, with most expenditures for staff, office space and supplies:

- The NWT government supports marine-related: education, culture and employment, environment and natural resources development, tourism and industry investment, and municipal and community affairs.
- The Nunavut government supports marine related: economic development, environmental protection and research, and cultural activities.

Table 5.28: Federal and territorial estimated ocean expenditures, Arctic, 2006

	Expenditures ($000s)	Employment (FTE)
Federal		
Fisheries and Oceans	45,190	100
Indian and Northern Affairs	2,500	5-10
Natural Resources Canada	1,000	1-3
Environment Canada	1,000	1-3
Sub-total federal	49,690	55-65
Territorial		
Transportation	4,900	n.a.
Wildlife and harvest	3,400	n.a.
Tourism	500	n.a.
Other	1,200	n.a.
Sub-total provincial	10,000	
Total	59,690	

Source: Departments/Agency, special tabulations

The following provides a summary of ocean activities from the Arctic region as discussed above.

Table 5.29: Total ocean activities revenues and expenditures, Arctic, 2006

	Output/ Expenditures ($000s)
Private sector	
Commercial fisheries	6,000
Fish processing	5,000
Arts and crafts	14,000
Transport	n.a.
Tourism and Recreation	2,550
Sub-total private	27,550
Public sector - Federal	
Fisheries and Oceans	45,190
Indian and Northern Affairs	2,500
Natural Resources Canada	1,000
Environment Canada	1,000
Sub-total federal	49,690
Public sector - Prov/Terr	
Transportation	4,900
Harvest and Wildlife	3,400
Tourism	500
Other	1,200
Sub-total prov/terr	10,000
Total	87,240

Sources: Departments/Agencies, special tabulations;
DFO, *Northern Shrimp Integrated Fisheries Management Plan*, 2003;
GSGislason, and Outcrop Ltd., *The Marine-Related Economy of NWT and Nunavut*, 2003.
Northern News Services, Opportunities North, 2008, p C9.
Statistics Canada, *Travel Survey of Residents of Canada*, 2007

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VI

CONCLUDING OBSERVATIONS

1. Growth potential

Seafood industry

- **Fishing:** the commercial fisheries on the Atlantic and Pacific coasts are essentially fully utilized. This means an expansion in participation is unlikely unless there is a substantial increase in stock abundance and a relaxation of rules governing entry to the fisheries (both of which have precedents). Even without any increase in participation, there is potential for economic growth in terms of higher returns to capital and labour, though this is contingent on increased stock abundance and improved market conditions. Stock depletion (groundfish on the Atlantic coast and salmon on the Pacific) have worked against the industry over the past 10-20 years, and there is limited evidence for a turnaround in these species in the near future. On the positive side, these declines have been offset to varying degrees by increased shellfish production, generally a more valuable species group. Nonetheless, the overall size of the commercial fisheries on both coasts – number of vessels and participants – has dropped, and with limited entry and the increasing use of individual transferable quotas, a return to the participation levels of the 1980s is unlikely. In short, any improvement in economic impacts is likely to be expressed in terms of GDP and income, rather than employment.
- **Aquaculture:** there is considerable scope for increased finfish production based on suitable habitat (more so on the Pacific coast than Atlantic), but the industry will have to address concerns over environmental degradation including threats to wild species in order for such expansion to come to fruition. Shellfish production faces less opposition from an environmental perspective, but access to ocean space is a constraint. There is public opposition from landowners in some areas due to aesthetic concerns, from commercial fishing interests about loss of fishing grounds, and from boat owners concerned about navigation risk. Some shellfish species also face market constraints, as the industry has been more successful in producing than marketing the product (e.g., mussels on the Atlantic coast).
- **Fish processing:** growth potential is tied largely to availability of raw material from the commercial fisheries and aquaculture. The industry faces a considerable challenge in expanding on the basis of raw material secured on the international market. Low-cost producers in Asia have driven up prices, and Canadian processors have difficulty competing given the higher local operating costs. Also, the value of Canadian exports to the U.S. has declined due to the weakness of the U.S. dollar. In short, the industry finds itself in difficult circumstances. Industry growth in future depends on some combination of improved local raw material supply, greater efficiency, stronger markets and more favourable exchange rates.

- **Offshore oil & gas:** the future looks promising, but is laden with great uncertainty and high risk. Two offshore projects – Hebron (oil/Grand Banks) and Deep Panuke (natural gas/Scotian Shelf) – are in the planning stage on the Atlantic coast. Their development in the next few years will result in positive fabrication, construction and services impacts, as well as increased revenues once production comes on stream. Further developments on the east coast depend on further discoveries of economically recoverable reserves. Offshore areas in the Arctic and on the Pacific coast may hold considerable potential. Federal and provincial policy moratoria prohibiting offshore oil and gas exploration and development in BC remain in place, and there are significant regulatory uncertainties associated with potential development. In all cases, frontier areas are expensive operating environments, both for drilling and development. Whether a discovery is economic depends on several factors including pool size, geology of the structure, capital cost of the development approach and energy prices. While it is tempting to offer optimistic views on development potential given North America's thirst for petroleum, the recent events in petroleum markets underscore the great uncertainty inherent in the oil & gas industry.
- **Marine transportation:** growth potential is tied to the demand for commodities shipped from Canada and demand for goods shipped in containers to Canada, mainly from the Far East. Until late 2008, these sources of demand resulted in a steady increase in cargo shipped through Canadian ports on both the Pacific and Atlantic coasts. A new container terminal was completed on the west coast in 2007, and there are two proposals to build additional terminals on the east coast. There are also proposals to build LNG terminals and additional refining capacity, both of which would add to the demand for marine transportation and support services. The global recession has caused a drop in demand for commodities, as well as manufactured goods shipped by container, and could affect the timing (and possibly the viability) of these various proposals. Growth potential in the long run appears to be strong given Canada's resource potential, though it may take a few years to regain the momentum of the past few.
- **Ocean tourism:** growth potential is tied to several factors including Canada's ability to maintain an attractive coastal environment, continued development of tourism capacity and opportunity (e.g., cruising, eco-tourism), the general economic climate, and competition from other destinations. All three forms of ocean tourism showed an upward trend over the past several years on the Pacific coast, while the opposite was true on the Atlantic coast. The short-term outlook is for weak performance resulting from the current recession, though this could be offset to some extent by the sharp drop in petroleum prices in late 2008. The long-term outlook is more promising; in an increasingly crowded world, Canada offers excellent opportunities for escape.
- **Shipbuilding and boat building:** Canada has seen a steady decline in its shipbuilding capacity over the past 20 years, as yards struggle to compete with yards in countries whose governments offer substantial financial support to the industry. Most of the work in Canadian yards is refit and repair, with new builds essentially limited to navy and Coast Guard vessels. The federal government has outlined major programs to replace aging vessels in both services, though the timing remains uncertain. The future of Canada's boatyards is tied to the demand for fishing vessels and pleasure craft. The fishing industry is not expanding, so demand arises essentially from the need to replace vessels. At best demand will be steady, with fluctuations linked to resource and market conditions. Several boatyards on the Pacific and Atlantic coasts have made a successful transition to the pleasure craft market. But this is a highly competitive market, and also subject to general economic trends. The short-term outlook is for weak demand.

- **Marine construction:** several proposed projects on the Atlantic, Pacific and Arctic coasts could result in a major increase in activity. These include container terminals, LNG facilities, bulk cargo expansions in the south, and a navy/Coast Guard re-supply facility in the Arctic. Global warming and the melting of the polar ice could eventually lead to commercial shipping through the Northwest Passage, with the possibility of port development to receive domestic shipments. Construction for the offshore will remain episodic, tied to discoveries and field developments. Otherwise, on-going port and harbour development is expected to result in steady demand for construction services.

2. Challenges and gaps

Obtaining essential economic data represents the greatest challenge in producing a report of this kind. The difficulty presents itself at the industry level for certain activities, and also at the geographic level. A summary of the status of quantifying output value and impacts for each activity is set out in Appendix H.

- **At the industry level**, data may be unavailable because the marine activity does not conform to an established NAICS classification; it may cut across several industries or form just part of a broadly based industry. These constraints may affect the ability to estimate impacts, but at the very least affect the approach taken and confidence in the results.
- **At the geographic level**, data are often unavailable for reasons of confidentiality – the number of establishments in the industry in that area may be too few to allow reporting – or because the particular area is not one well covered by Statistics Canada. This may present difficulties if, as in this case, analysis and reporting are required at a regional level.

These particular challenges do not affect all marine activities, but few activities are without at least some analytical challenge. Taking each in turn:

- **Commercial fisheries**: Two sources of data are available for value of output data. DFO publishes value of landings data for the commercial fisheries by province with about a one-year lag. These data are available on the DFO website: (http://www.dfo-mpo.gc.ca/index-eng.htm). Statistics Canada uses these data for its commercial fisheries data at the provincial level, though with a 3-4 year lag (CANSIM 381-0016 http://estat.statcan.gc.ca/cgi-win/CNSMCGI.EXE). Statistics Canada relies on these data, its own surveys and also administrative (taxation) data to calibrate its input-output model and to develop annual GDP estimates.

  Employment estimates for the fisheries represent one area of weakness. It is possible to estimate the level of participation from employment insurance data (number of claims), but at best this gives a lower bound on the numbers because not all participants claim. DFO fisher registration data would provide an upper bound, but not all those who register to fish actually do so. There are no official data on full-time equivalents, and no reliable way to estimate this. In part this reflects the status of crewmembers – they are classified as independent contractors, not employees – and in part the seasonal nature of the fisheries. Work is not confined to the time spent fishing, but also extends to preparation time before and maintenance time at the end of the season. The employment estimates contained in the impact analysis are derived from the results of the input-output model runs. The model calculates the level of employment needed to reach a given output level based on income levels derived from administrative and survey data.

- **Aquaculture**: There is good reporting of aquaculture statistics (including production and value by species, number of sites and numbers employed) by provincial departments: (http://www.fishaq.gov.nl.ca/stats/default.stm
http://www.gov.ns.ca/fish/aquaculture/stats/index.shtml
http://www.gov.pe.ca/fa/aqu-info/index.php3
http://www.gnb.ca/0168/01680004-e.asp
http://www.env.gov.bc.ca/omfd/reports/index.html
Value added accounts for the industry in each province are published by DFO (http://www.dfo-mpo.gc.ca/communic/statistics/aqua/index_e.htm) and Statistics Canada (CANSIM 381-0016 http://estat.statcan.gc.ca/cgi-win/cnsmcgi.pgm. There is about a one-year lag in reporting by the province and DFO. Statistics Canada relies on production data, its own surveys and also administrative (taxation) data to calibrate its input-output model and to develop annual GDP estimates.

- **Fish processing**: Annual output value and other key manufacturing statistics from Statistics Canada is available for 2004-2006 online through CANSIM 301-0006, and for earlier years from CANSIM 301-0003 and 301-0005 http://cansim2.statcan.ca/cgi-win/cnsmcgi.exe?Lang=E&RootDir=CII/&ResultTemplate=CII/CII___&Array_Pick=1&ArrayId=3010006 Export statistics are available online from the Industry Canada Strategis website
http://strategis.gc.ca/sc_mrkti/tdst/tdo/tdo.php?lang=30&headFootDir=/sc_mrkti/tdst/headfoot&productType=HS6&cacheTime=962115865#tag

  Other industry data such as number of plants and employment are also compiled by some provinces, but there is a lack of consistency in the provincial approaches. One issue with the output data is inclusion of imported raw material in the production and export statistics. This is a concern if the rationale for including seafood processing is its linkage with *domestic* fisheries. Otherwise it is not an issue (this study does not consider this an issue). The contribution to output of imported raw material can be substantial, e.g., New Brunswick lobster processors rely heavily on Maine lobster as a source of raw material.

- **Oil & gas**: GDP and output data for the offshore oil & gas industry in Newfoundland and Labrador and Nova Scotia are suppressed by Statistics Canada due to confidentiality restrictions. Value of output can be estimated using published production data (quantity) applied to average market prices. Monthly production data can be obtained from the CNSOPB (http://www.cnsopb.ns.ca/production.php). Value can be derived by using monthly average natural gas import prices (U.S. northeast) obtained from the U.S. EIA (http://tonto.eia.doe.gov/dnav/ng/ng_move_poe1_a_EPG0_PRP_DpMcf_a.htm) and adjusted for the Canada-U.S. exchange rate and netting out the pipeline toll (to obtain the producer's net-back revenue). The derivation of the output values used in this report is set out in Appendix A.

  For the Newfoundland and Labrador offshore, this means obtaining monthly production data (from the CNLOPB) and deriving revenue by using monthly average oil prices based on a benchmark crude with similar specifications (e.g., Brent) and adjusting for the Canada-U.S. exchange rate (oil is traded in U.S. dollar terms). For Nova Scotia, this means obtaining monthly production data (from the CNSOPB) and deriving revenue by using monthly average natural gas import prices (U.S. northeast) adjusted for the Canada-U.S. exchange rate and netting out the pipeline toll (to obtain the producer's net-back revenue).

  Other data on the offshore industry tends to be reasonably well reported by the offshore boards, though expenditure data on project development vs. operations are not distinguished in CNSOPB reports. Unless the analyst has access to this detail (which is the case for this analysis), impacts could only be reported with wide confidence limits.

- **Marine transportation**: GDP and output data for marine transportation (NAICS 4831) are available at the national level, but are suppressed by Statistics Canada for some provinces in some years due to confidentiality restrictions. These data only cover the "for-hire" segment of the industry, not the marine transportation activity of companies that ship using their own vessels (referred to as "own-account" shipping). Though Statistics Canada has developed a satellite account for "own-account" activity, for reasons having to do with definitional purity, the value of this activity is not included in the analysis and impact results of this report. Since the satellite account analysis concluded that the value of own-account activity is actually greater than that of for-hire, the results set out in this report must be considered highly conservative.

  Another serious issue is that no data at all are available for Support Services for Water Transportation (NAICS 4883) because Statistics Canada incorporates this activity in the broader grouping, Support Services for Transportation (NAICS 488). If a complete picture of the water transportation sector is to be developed, then it is necessary to estimate the contribution of support activities using indirect methods. The estimate contained in this report is based on historical data (1997-2000) that distinguished NAICS 48311 and 4883 and allowed the relative contribution to GDP of the activities to be determined (the ratio of 4883/48311 is 1.5:1.0). This ratio is confirmed by current U.S. data for these industries.

- **Tourism and recreation:** Comprehensive data on the tourism sector are not systematically compiled in Canada. This study relies on three secondary sources. Two are focused on specific marine related tourism activities, cruise ship travel and recreational fishing, with expenditure data available on a provincial basis. The third – the *Travel Survey of Residents of Canada* conducted quarterly by Statistics Canada – addresses tourism generally, but allows the analyst to extract participation data (days and expenditures) on specific activities including several with an oceans focus (coastal hiking, diving, kayaking, sailing, visiting beaches). Ideally, the analyst would obtain electronic files of the recreational fishing and TSRC survey databases from DFO and Statistics Canada in order to extract the relevant data (these were obtained for this analysis).

  Taken together, the three sources provide a good approximation of the economic impact of ocean tourism, though results should be regarded as conservative because the criteria for what constitutes a "trip" lead to an under-estimation of local residents' participation in ocean activities, and also because non-residents are not included in the survey.

  With the data, the next step is to run the expenditures through the input-output model. But tourism is not one of the 303 industries for which input and output vectors have been developed in Statistics Canada's model. This means expenditures have to be sorted by industry (the surveys provide a breakdown of expenditures by category) and province, entered into a template provided by Statistics Canada, and submitted to run the model.

- **Marine construction:** GDP and output data are not available for this activity. This is because it is not an exclusively marine activity. For purposes of running the input-output model, marine construction would fall under a broad construction category: other heavy and civil engineering construction (NAICS 2379), which includes both marine- and land-based construction activity. Expenditure data to run the model must be compiled from several sources including individual port authorities (not just for their own data, but for construction expenditures generally in each port), DFO for small craft harbours, DND for naval base capital expenditures, provinces and ferry companies for terminal expenditures and offshore boards for oil & gas development expenditures. These sources would exclude capital spending at private facilities and hence would underestimate overall construction impacts.

- **Shipbuilding and boat building:** Output value is published by Statistics Canada, though data are suppressed in some years due to confidentiality restrictions. Output value from Statistics Canada (subject to confidentiality) is available online through CANSIM 301-0006 (for 2004-2006) and for earlier years from CANSIM 301-0003 and 301-0005. (http://cansim2.statcan.gc.ca/cgi-win/CNSMCGI.EXE?Lang=E&ArrayId=301-0006&Array_Pick=1&Detail=1&ResultTemplate=CII/CII___&RootDir=CII/) For the years under consideration in this study, the data are confidential. Output data was obtained from Statistics Canada by special request.

  Though only data from coastal provinces is used in the impact analysis, it is possible that yards in these provinces may manufacture for freshwater use, and conversely, that manufacturers in inland provinces may build for marine use. This source of error is likely to be small.

  Beyond ship and boats, navigation and research equipment is also manufactured for ocean uses. But the manufacturers do not fall into a unique NAICS marine manufacturing industry. They fall under a broader industry grouping that includes mainly companies producing for aeronautical applications. Consequently, output value, the key statistic that would allow industry impacts to be determined, is unavailable.

3. Emerging issues

Although valuation of non-market goods and services has been underway for decades, the importance and policy-relevance of this work was brought to prominence in 1997 when Robert Costanza led a team of researchers that published estimated values for the world's ecosystem services and natural capital. The estimates spurred deliberation regarding methodology and accuracy, but consensus began to emerge in support of the finding that non-market values in aggregate exceeded market values at the global level. Arguably, this suggested that efforts to maintain maximum value and long-term sustainability of resource use and ecosystem services might be equally if not better informed by appreciating non-market goods and services. This was followed by an upsurge in ecological valuation work including many studies pertaining to oceans and coastal marine ecosystems.

The main subjects of non-market valuation research for oceans and marine ecosystems include:

- ocean physical resources (real estate value, shoreline protection, aesthetics, ambient and facilities temperature moderation, geological features);
- aspects of marine tourism and recreation;
- ecosystem services (biodiversity, waste assimilation, life support, climate regulation); research and education, culture and heritage, health (air and water quality); and
- investment (bequest and option values).

Valuation of non-market goods and services is most commonly carried out within a total economic value framework (market and non-market). Values are classified into use and non-use. Use values include direct, indirect, and option values, while non-use values include existence, bequest, and altruism values. The methodologies for determining non-market value include:

- revealed preference (hedonic and travel cost methods);
- stated preference (contingent valuation and choice modeling);
- benefits transfer; and
- cost methodologies (replacement, avoided, and opportunity cost).

The most significant challenges to building comprehensive total economic valuations for oceans and coastal marine resources involve: the inherent complexity of ecosystems and ability to identify non-market goods and services, difficulties integrating interdisciplinary research that characterizes oceans, the need for primary data collection, delineating the boundaries for valuation work, double counting, and distributional issues (who bears costs and benefits that are identified).

It is clear that non-market values are important and significant; policy and decision-making would be greatly improved with the availability of total economic value estimates. Methods and capacity exist to undertake the work required, but some ranking of priorities would be required given the challenges and long-term view to building the data required.

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APPENDIX A: OFFSHORE CRUDE OIL AND NATURAL GAS VALUE OF OUTPUT ESTIMATES

Table A-1: Estimate of output value (revenues) for Atlantic Region offshore oil projects

	Production Volume		Price		Export value	Toll	Pipeline toll	Netback to SOEP
	cubic metres	mcf	US$/mcf	CDN$/US$	CDN $	$/mcf	$	$
	1	2	3	4	5	6	7	8
2000	3,597,144	127,033,137	4.50	1.49	851,757,187	1.2	152,439,765	699,317,422
2001	5,375,353	189,828,778	4.47	1.60	1,357,655,422	1.2	227,794,534	1,129,860,888
2002	5,474,993	193,347,514	3.49	1.57	1,059,409,033	1.2	232,017,017	827,392,016
2003	4,665,769	164,770,062	5.85	1.40	1,349,466,811	1.2	197,724,075	1,151,742,736
2004	4,327,897	152,838,235	6.44	1.30	1,279,561,705	1.2	183,405,882	1,096,155,823
2005	4,225,762	149,231,375	9.40	1.21	1,697,357,655	1.2	179,077,650	1,518,280,005
2006	3,794,706	134,008,769	7.73	1.13	1,174,696,744	1.2	160,810,522	1,013,886,222
2007	4,403,030	155,493,001	7.57	1.08	1,265,363,168	1.2	186,591,601	1,078,771,567
2008	4,636,880	163,751,413	9.50	1.07	1,658,310,564	1.2	196,501,696	1,461,808,868

1. CNSOPB annual production volume. http://www.cnsopb.ns.ca/production.php
2. Converted to mcf (thousand cubic feet) @ 1 mcf = 0.02831685 m3
3. US Energy Information Agency, based on price of natural gas via pipeline to Calais (2008 preliminary). http://tonto.eia.doe.gov/dnav/ng/ng_move_poe1_a_EPG0_PRP_DpMcf_a.htm
4. Average annual exchange rate (Bank of Canada). http://www.bankofcanada.ca/en/rates/exchange_avg_pdf.html
5. Value of production in CDN $
6. Toll on Maritimes & Northeast Pipeline
7. Toll cost/year
8. Netback to SOEP used as driver for I-O model

Table A-2: Estimate of output value (revenues) for Atlantic Region natural gas projects

	Production (millions of barrels)				Price	Revenue	Exchange rate	Revenue
	Hibernia	Terra Nova	White Rose	Total	US$/bbl	US$ (millions	CDN$/US$	CDN$ (millions)
	1	1	1	1	2	3	4	5
1997	1	0	0	1	19	24	1.38	33
1998	24	0	0	24	13	304	1.48	449
1999	36	0	0	36	18	651	1.49	967
2000	53	0	0	53	29	1,513	1.49	2,247
2001	54	0	0	54	24	1,328	1.55	2,056
2002	66	38	0	104	25	2,600	1.57	4,082
2003	74	49	0	123	29	3,567	1.40	4,994
2004	75	40	0	115	38	4,370	1.30	5,681
2005	73	35	3	111	55	6,105	1.21	7,387
2006	68	12	30	110	65	7,150	1.13	8,108

1. CNLOPB annual production volume. http://www.cnloph.nl.ca/stat_rm.shtml
2. Price based on Brent spot price, FOB Whiffen Head, Newfoundland and Labrador. http://tonto.eia.doe.gov/dnav/pet/hist/rbrteA.htm
3. Value of production in US$.
4. Average annual exchange rate (Bank of Canada). http://www.bankofcanada.ca/en/rates/exchange_avg_pdf.html
5. Revenue in Canadian dollars used as driver for I-O model

APPENDIX B: WATER TRANSPORTATION SECTOR OUTPUT ESTIMATES

Statistics Canada reports output and GDP data for Water Transportation (NAICS #4831), but not for Support Activities for Water Transportation (NAICS #4883). NAICS 4831 covers the ships, while NAICS 4883 covers port activities. From an economic impact perspective, NAICS 4883 is the more significant industry because of the scope of activities it encompasses.

To obtain a complete picture of the economic impact of the marine transportation sector, it is necessary to estimate an output value for Support Activities for Water Transportation. This is possible using historical data. The first step involves establishing the respective contributions to GDP of each activity; the second step requires establishing the level of output needed to produce this GDP (the GDP/output ratio).

Under the former Standard Industrial Classification (SIC) system, these components formed a single industry for statistical purposes (Water Transportation #449), though up until 2000, data for each component was reported separately by Statistics Canada. With the transition to NAICS, support activities for all transportation modes were grouped into a single industry (Support Activities for Transportation NAICS #488). Thus, support activities for water transportation were bundled with, and became indistinguishable from, corresponding services for rail, truck and air transportation.

It is possible to estimate the size of the Support Activities industry by examining the period of overlap between SIC and NAICS in the years leading up to 2000. Table B-1 shows that as a single industry under SIC, Water Transportation and Related Services generated $2,995 million in GDP ($2002) at the national level in 2000. The earliest NAICS data goes back to 1997, and shows that Water Transportation (NAICS #483) generated $1,147 million in 2000. The difference between the two represents Support Activities (NAICS #488), with a $1,848 million contribution to GDP. Table B-1 indicates that the ratio of Support Activities to Water Transportation is about 1.5. In other words, for every $1.00 of GDP generated in Water Transportation, another $1.50 is generated in Support Activities.

Table B-1: Contribution to GDP - ratio of NAICS 488 to NAICS 483

	Water transportation & services (SIC)	Water Transportation NAICS 483	Support Activities NAICS 488	Ratio 488/483
		$2002 millions		
1997	2,470	982	1,488	1.52
1998	2,494	985	1,509	1.53
1999	2,608	1,086	1,522	1.40
2000	2,995	1,147	1,848	1.61

Source: CANSIM V328820; Statistics Canada, special tabulation

Support for this relationship may be found in the U.S. marine transportation data. Table B-2 shows a ratio for the two industries (NAICS 483 and 488) averaging just under 1.5 for the period 2000-2004 (the latest year for which data are available). The U.S. Bureau of Census reports data for both industries, allowing the relative magnitudes of the industries to be readily observed.

Table B-2: Contribution to GDP (U.S.) – Water Transportation and Support Activities

	Water Transportapport Activities		
	NAICS 483	NAICS 488	Ratio 488/483
	$US millions		
2000	4,901	7,063	1.44
2001	4,934	7,240	1.47
2002	4,625	7,474	1.62
2003	6,036	8,139	1.35
2004	5,457	8,713	1.6

Source: U.S. Bureau of Census

Though it may be reasonable to assume a stable 1.5:1.0 ratio exists with respect to GDP, it does not follow that this same ratio applies to the respective values of industry output. This is because NAICS 4831 and 4883 industry structures differ, resulting in different levels of output needed to produce a unit of GDP. This is evident from the direct multipliers in Appendix G. Given these multipliers, determining the output value for NAICS 4883 is a matter of solving for the value that results in a level of direct GDP that is 1.5 times higher than that for NAICS 4831. Once the value of output is obtained, it is possible to run the Statistics Canada I-O Model to obtain the full array of impact estimates.

The set of derived output values for each of the provinces is shown in Table B-3.

Table B-3: Output values for NAICS 4831 and 4883

	NAICS 4831			NAICS 4883			GDP ratio
Output in $000s	Output	GDP Multiplier	GDP	Output	GDP Multiplier	GDP	4883/4831
Newfoundland and Labrador	222,000	0.35	77910	212,000	0.55	116,600	1.5
Nova Scotia	243,000	0.41	99630	281,000	0.54	151,740	1.5
New Brunswick	72,000	0.40	28,800	81,000	0.54	43,740	1.5
Prince Edward Island	21,400	0.20	4,280	14,000	0.46	6,440	1.5
Québec	314,000	0.45	141,300	415,000	0.52	215,800	1.5
British Columbia	1,911,000	0.45	859,950	2,484,000	0.52	1,291,680	1.5

Source: Statistics Canada, special tabulation for NAICS 4831 data; Appendix G for multipliers.

APPENDIX C: TOURISM AND RECREATION EXPENDITURE ESTIMATES

1. Recreational fishing

Data and approach

Recreational fishing surveys conducted in 2000 and 2005 by Fisheries and Oceans were used to derive participation levels and expenditure estimates. The surveys include residents and visitors to Canada. Only direct expenditures or purchases and investments wholly attributable to fishing were included. Straight-line interpolation and extrapolation were used to derive estimates for years not covered by surveys (2001-2004, and 2006). The ratio of saltwater expenditures to freshwater expenditures per day in British Columbia was used to extract a saltwater expenditure per day estimate from combined fresh and saltwater spending data. The number of saltwater days (Table C-1) was multiplied by the estimated saltwater expenditures per day (Table C-2) for each jurisdiction to determine total spending (Table C-3).

Table C-1: Participation days by province for anglers of all origins (2000-2006)

(Days)	2000	2001	2002	2003	2004	2005	2006
BC	1,997,979	2,041,777	2,085,576	2,129,374	2,173,172	2,216,970	2,260,765
NL	327,317	352,279	377,240	402,201	427,163	452,124	477,085
NS	256,077	244,622	233,167	221,712	210,257	198,802	187,347
QC	253,680	242,433	231,186	219,938	208,691	197,444	186,197
PEI	71,343	69,377	67,412	65,446	63,481	61,515	59,549
NB	48,211	46,737	45,262	43,787	42,313	40,838	39,363
Nun	2,894	3,097	3,300	3,503	3,706	3,909	4,112
Canada	2,957,501	3,000,321	3,043,141	3,085,962	3,128,782	3,171,602	3,214,422

Source: Derived from DFO, 2000 and 2005. Survey of Recreational Fishing in Canada.

Table C-2: Angling expenditures per day by province for anglers of all origins (2000-2006)

($/day)	2000	2001	2002	2003	2004	2005	2006
BC	$244	$253	$261	$270	$278	$285	$293
QC	$251	$217	$188	$163	$140	$120	$102
NL	$197	$199	$201	$203	$206	$209	$212
NS	$85	$87	$90	$92	$95	$98	$101
NB	$101	$103	$105	$108	$111	$114	$117
PEI	$37	$40	$43	$46	$49	$52	$56
Nun	$260	$250	$240	$232	$225	$218	$212
Canada	$220	$224	$228	$232	$235	$239	$242

Source: Derived from DFO, 2000 and 2005. Survey of Recreational Fishing in Canada.

Table C-3: Angling expenditures by province for anglers of all origins (2000-2006)

($000)	2000	2001	2002	2003	2004	2005	2006
BC	$486,788	$515,982	$545,177	$574,371	$603,566	$632,760	$661,954
QC	$82,173	$76,593	$71,012	$65,432	$59,852	$54,271	$48,691
NL	$50,419	$48,635	$46,851	$45,066	$43,282	$41,498	$39,714
NS	$21,672	$21,192	$20,712	$20,232	$19,752	$19,273	$18,793
NB	$7,174	$7,142	$7,109	$7,077	$7,045	$7,013	$6,981
PEI	$1,795	$1,864	$1,932	$2,000	$2,069	$2,137	$2,206
Nun	$754	$773	$793	$813	$832	$852	$872
Canada	$650,774	$672,180	$693,586	$714,992	$736,398	$757,804	$779,210

Source: Derived from DFO, 2000 and 2005. Survey of Recreational Fishing in Canada.

Input-output concordance

The breakdown of Canada-wide direct expenditures (packages, food and lodging, transportation, services, supplies and other), and purchases or investments wholly attributable to fishing (equipment, vehicles, land and buildings) from the 2000 and 2005 surveys were used to allocate estimates into expenditure categories and I/O commodities (Table C-4). Straight-line interpolation and extrapolation was used to derive expenditure distributions for years not covered by surveys

(2001-2004, and 2006). Food, lodging, and transport spending categories were further divided according to Canadian tourist spending patterns that provide a basis for linkages with the I/O model commodities. Boat equipment and vehicle expenditures were also further divided to reflect the distribution of item purchases, repairs, maintenance, and vehicle trailer expenses. The refined categories were aligned with the Statistics Canada 2005 I/O commodity numbers and codes. The estimated expenditure amounts for each category were entered into a StatCan I/O template to flow through to the assigned commodities in the model to generate impacts.

Table C-4: Recreational fishing expenditure weighting and concordance for StatCan 2005 IO model

Category	Weight	StatCan No.	StatCan Code	Description
Packages	0.097	567	5321	Travel agents, tour wholesaler and operator services
Food and	0.023	647	56901	Hotel and motel accommodation services
Lodging	0.003	648	56902	Other accommodation services
	0.023	649	57001	Meals (outside home)
	0.000	138	1162	Distilled alcohol beverages, consumed on license premises
	0.000	140	1192	Beer including coolers, consumed on license premises
	0.000	142	1202	Wine including coolers, consumed on license premises
	0.098	600	5531	Retailing margins
	0.001	137	1161	Distilled alcohol beverages, bought in stores
	0.002	139	1191	Beer including coolers, bought in stores
	0.002	141	1201	Wine including coolers, bought in stores
Transport	0.033	446	3950	Motor gasoline
	0.084	560	5301	Air transportation, passenger
	0.049	448	3962	Diesel oil
	0.002	451	3970	Lubricating oils and greases
Fishing services	0.035	567	5321	Travel agents, tour wholesaler and operator services
Supplies	0.034	39	0300	Hunting and trapping products
Other	0.019	600	5531	Retailing margins
Fishing equipment	0.040	600	5531	Retailing margins
Boat equipment	0.121	396	3520	Pleasure boats and sporting craft
	0.035	394	3500	Ship repairs
	0.017	379	3391	Non-commercial trailers
Camp equipment	0.064	600	5531	Retailing margins
Vehicles	0.108	373	3350	Trucks, road tractors and chassis
	0.012	597	55101	Automotive repair and maintenance service
Land/Buildings	0.097	554	5240	Non-residential building construction
Total	1.000			

Source: Derived from DFO, 2000 and 2005. Survey of Recreational Fishing in Canada; Statistics Canada Travel Survey of Residents of Canada, 2006.

2. *Cruise travel*

Data and approach

Canadian cruise industry surveys conducted in 2003 and 2007 by Business Research and Economic Advisors (BREA) were used to estimate cruise-related activity levels and expenditures. The expenditures reported here only include those made by passengers and crew, since cruise line expenditures provided by BREA are already captured by Statistics Canada marine transport accounts. The BREA studies include annual passenger visit statistics for 2002-2007, but only report detailed expenditure data for the two study years. Reported passenger and crew expenditures for 2003 and 2007 were therefore adjusted using the annual passenger traffic data, to derive estimates for years not covered by surveys (2002, 2004-2006). Estimates of passenger traffic (Table C-5) combined with spending per passenger (Table C-6) provide total spending by passengers and crew (Table C-7) for input to the I/O model.

Table C-5: Cruise ship passenger traffic by province (2002-2007)

(Visitors)	2002	2003	2004	2005	2006	2007
BC	1,237,608	1,129,498	1,235,401	1,269,754	1,263,335	1,091,955
QC	105,847	87,832	108,788	94,676	111,957	110,136
NS	199,580	215,693	272,985	249,589	221,164	219,595
NL	25,956	28,052	32,284	40,515	37,406	36,885
NB	71,168	83,300	138,703	90,203	87,759	133,676
PEI	13,697	14,803	21,948	23,025	28,144	19,358
Other Canada	0	0	0	0	0	0
Totals	1,653,857	1,559,178	1,810,109	1,767,762	1,749,765	1,611,605

Sources: Derived from Business Research and Economic Advisors (2004, 2008). The economic contribution of the international cruise industry in Canada.

Table C-6: Cruise ship passenger and crew expenditures per passenger by province (2002-2007)

($/passenger)	2002	2003	2004	2005	2006	2007
BC	$209	$237	$266	$294	$323	$351
QC	$251	$248	$246	$243	$241	$239
NS	$118	$110	$102	$95	$87	$79
NL	$91	$86	$80	$74	$68	$62
NB	$100	$94	$87	$80	$74	$67
PEI	$101	$95	$88	$81	$74	$67
Other Canada	NA	NA	NA	NA	NA	NA
Totals	$202	$216	$227	$250	$270	$276

Sources: Derived from Business Research and Economic Advisors (2004, 2008). The economic contribution of the international cruise industry in Canada.

Table C-7: Cruise passenger and crew expenditures by province (2002-2007)

($000)	2002	2003	2004	2005	2006	2007
BC	$258,321	$267,900	$328,177	$373,439	$407,505	$383,300
QC	$26,520	$21,800	$26,746	$23,053	$26,998	$26,300
NS	$23,458	$23,700	$27,904	$23,601	$19,219	$17,400
NL	$2,371	$2,400	$2,575	$2,996	$2,549	$2,300
NB	$7,132	$7,800	$12,075	$7,260	$6,486	$9,000
PEI	$1,389	$1,400	$1,925	$1,862	$2,083	$1,300
Other Canada	$14,628	$12,000	$11,852	$9,545	$7,438	$5,000
Totals	$333,820	$337,000	$411,255	$441,756	$472,278	$444,600

Sources: Derived from Business Research and Economic Advisors (2004, 2008). The economic contribution of the international cruise industry in Canada.

Input-output concordance

The breakdown of aggregate expenditures (excluding cruise lines) provided in the 2007 study was used to allocate estimates to a set of expenditure categories (Table C-8). The BREA categories were already set according to NAICS codes and assignment of estimates to the I/O model was straight-forward. Only the expenditures for business and computer services were split 50/50 into business services and computer services I/O commodities. The estimated expenditure amounts for each category were then entered into a StatCan I/O template to flow through to the assigned commodities in the model to generate impacts.

Table C-8: Cruise travel expenditure weighting and concordance for StatCan 2005 IO model

Category	Weight	StatCan No.	StatCan Code	Description
Business and computer	0.048	644	5662	Accounting and legal services
services	0.048	667	57614	Other administrative and support services
Travel agents	0.078	567	5321	Travel agents, tour wholesaler and operator services
Fuel	0.054	448	57001	Diesel
Food and Beverages	0.144	649	57001	Meals (outside home)
Airfares	0.042	560	5301	Air transport, passenger
Hotel Supplies	0.042	647	56901	Hotel and motel accommodation services
Advertising and promotion	0.030	645	5670	Advertising and promotion
Wages and Salaries	0.030	710	5990	Wages and salaries
Machinery and equipment	0.024	352	3213	Other general machinery
Port charges and fees	0.018	573	5340	Services incidential to water transport
Maintenance and repairs	0.012	394	3500	Ship repairs and maintenance
Other expenses	0.252	600	5531	Retailing margins
Lodging	0.101	647	56901	Hotel and motel accommodation services
Tours and transportation	0.031	567	5321	Travel agents, tour wholesaler and operator services
	0.016	564	53111	Scenic and sightseeing transportation, bus
	0.031	680	5850	Travelling and entertainment
Total	1.000			

Sources: Derived from Business Research and Economic Advisors (2004, 2008). The economic contribution of the international cruise industry in Canada.

3. *Coastal tourism and recreation*

This segment is divided into three distinct components according to type if activity and source of data: a) coastal tourism, b) marine recreational boating and c) beach activities.

a) Coastal tourism

Data and approach

Statistics Canada is now making microdata files available from its annual travel surveys, starting with 2006 data releases for the Travel Survey of Residents of Canada (TSRC) and the International Travel Survey (ITS). The sample sizes from the ITS become small when isolating the marine travel components; only the TSRC was used here to assess marine-related tourism patterns in Canada. These patterns were then applied to annual aggregate spending figures for both Canadian and international travel activity levels and spending from 2000-2006.

First, the 2006 TSRC data were used to identify domestic tourism trips with visits or main destinations to Canadian coastal census districts. The following seven trip activities were then identified as potentially marine-related in coastal areas: walking, sightseeing, camping, hiking, birdwatching, beach activities, and paddling. Fishing was not included since this was already captured through the recreational fishing data. Similarly, all activities and spending by cruise travelers were excluded to avoid double counting. Coastal trips with marine activities were tallied to provide total counts. For each trip, the number of marine-related activities was divided by the total number of activities (marine and non-marine), then multiplied by the corresponding number of trip days to derive the trip time (days) spent on marine-related activities. Finally, on the basis of time spent, a marine component was extracted from total spending per trip, and this was combined for all trips to yield aggregate marine-related spending by jurisdiction for 2006 domestic travelers defined as tourists.

The buildup of Canadian and international spending figures then began with combined Canadian and International trip counts (Table C-9). The 2006 TSRC patterns for marine related activities (Table C-10) were applied to aggregate spending (StatCan re-allocated expenditures for tourism) from 2000-2006 to get estimates of marine-related spending per trip (Table C-11) and total spending estimates (Table C-12).

Table C-9: Trips with marine-related activities by province, excluding cruise & recreational fishing (Canadian & international origins, 2000-2006)

(Trips)	2000	2001	2002	2003	2004	2005	2006
BC	4,076,781	4,076,714	3,649,537	3,229,660	3,063,767	3,253,548	3,443,640
NS	2,277,920	2,261,085	2,677,639	2,312,278	2,273,004	2,288,265	2,305,983
QC	916,947	910,066	1,027,972	1,053,368	1,084,612	1,170,208	1,255,588
NB	970,299	1,055,124	1,221,011	1,126,351	1,012,422	1,012,219	1,013,234
NL	985,724	974,055	942,793	800,190	776,098	764,295	753,631
PEI	264,937	256,169	297,487	246,909	246,253	257,825	269,487
MN	2,997	3,024	2,870	2,712	2,758	3,008	3,257
NWT	U	1,533	1,923	1,412	1,714	840	1,506
Total	7,949,768	8,085,414	8,356,746	7,624,090	7,791,468	8,419,792	9,046,324

Sources: Derived from Statistics Canada Travel Surveys or Residents of Canada and International Travel Surveys, 2000-2006.
Note: U refers to unreliable or unavailable data.

Table C-10: Days of participation in marine-related activities by province, excluding cruise & recreational fishing (Canadian & international origins, 2006)

(Days)	Walking	Sightseeing	Camping	Hiking	Birdwatching	Beach	Canoe/Kayak	Total
BC	1,974,592	1,714,535	287,090	1,257,616	83,682	613,650	100,091	6,031,216
NS	1,647,797	871,213	137,655	295,144	26,376	407,489	89,603	3,475,277
QC	1,203,429	416,240	153,649	206,405	97,253	204,096	110,558	2,391,631
NB	728,573	392,459	96,378	159,014	28,827	180,236	69,152	1,654,639
NL	570,259	341,499	45,479	247,934	21,266	94,275	41,817	1,362,529
PEI	147,957	154,131	36,636	53,246	15,103	96,890	13,172	517,136
MN	121	3,415	0	0	0	0	0	3,536
NWT	696	0	0	0	0	0	0	696
Total	6,273,424	3,893,492	756,848	2,219,359	272,508	1,596,637	424,394	15,436,662

Sources: Derived from Statistics Canada Travel Surveys or Residents of Canada and International Travel Surveys, 2000-2006.

Table C-11: Tourist spending per trip attributed to marine-related activities by province, excluding cruise & recreational fishing (Canadian & international origins, 2000-2006)

($/trip)	2000	2001	2002	2003	2004	2005	2006
BC	$162	$164	$187	$190	$206	$203	$201
NS	$108	$127	$119	$130	$130	$124	$118
QC	$160	$171	$180	$168	$175	$162	$152
NB	$171	$166	$162	$149	$164	$162	$160
NL	$167	$177	$186	$209	$202	$186	$170
PEI	$237	$245	$214	$239	$245	$244	$243
MN	$372	$432	$396	$418	$444	$404	$372
NWT	U	U	$239	U	U	U	$314
Total	$167	$178	$179	$177	$186	$175	$167

Sources: Derived from Statistics Canada Travel Surveys or Residents of Canada and International Travel Surveys, 2000-2006.
Note: U refers to unreliable or unavailable data.

Table C-12: Tourist spending attributed to marine-related activities by province, excluding cruise & recreational fishing (Canadian & international origins, 2000-2006)

($000)	2000	2001	2002	2003	2004	2005	2006
BC	$660,637	$667,408	$682,053	$614,909	$632,103	$661,014	$690,869
NS	$245,160	$287,957	$318,785	$300,651	$295,852	$283,231	$271,982
QC	$146,700	$156,039	$185,086	$176,616	$190,152	$189,925	$190,300
NB	$166,381	$174,832	$197,341	$167,866	$166,443	$164,083	$162,327
NL	$164,428	$172,181	$175,055	$167,109	$156,941	$142,044	$128,167
PEI	$62,871	$62,705	$63,672	$58,980	$60,433	$62,938	$65,542
MN	$1,115	$1,305	$1,138	$1,133	$1,225	$1,216	$1,211
NWT	U	U	$460	U	U	U	$473
Total	$1,329,728	$1,442,461	$1,495,136	$1,348,381	$1,447,380	$1,477,402	$1,510,872

Sources: Derived from Statistics Canada Travel Surveys or Residents of Canada and International Travel Surveys, 2000-2006.
Note: U refers to unreliable or unavailable data.

Input-output concordance

The TSRC reports data according to eleven (11) spending categories including: accommodation, vehicle rental, vehicle operation, local transport, commercial transport, restaurant, food store, sport and recreation, cultural and entertainment, clothing and footwear, and other. The Canada-wide proportion of marine-related spending in each of these categories was determined from the TSRC dataset. These categories were further subdivided in most cases to better distribute spending according to the 2005 StatCan I/O model. Where possible, further subdivisions were based on StatCan studies of tourism spending patterns, otherwise expenditures were divided equally across I/O commodities that matched the spending category description. The resulting weighting and concordance for the StatCan model was used for spending in all jurisdictions (Table C-13). The estimated expenditure amounts for each category by jurisdiction were then entered into a StatCan I/O template to flow through to the assigned commodities in the model to generate impacts.

Table C-13: Tourism expenditure weighting and concordance for StatCan 2005 IO model commodity codes

Category	Weight	StatCan No.	StatCan Code	Description
Accommodation	0.180	647	56901	Hotel and motel accommodation services
	0.020	648	56902	Other accommodation services
Vehicle rental	0.030	669	5770	Rental of automobiles and trucks
Vehicle operation	0.068	597	55101	Automotive repair and maintenance service
	0.068	446	3950	Motor gasoline
	0.003	448	3962	Diesel oil
	0.021	451	3970	Lubricating oils and greases
Local transport	0.004	564	53111	Scenic and sightseeing transportation, bus
	0.001	581	5390	Taxi and limousine transportation services
Commercial transport	0.165	560	5301	Air transportation, passenger
	0.005	574	5351	Rail transportation, passenger
Restaurant	0.185	649	57001	Meals (outside home)
	0.003	138	1162	Distilled alcohol beverages, consumed on license premises
	0.004	140	1192	Beer including coolers, consumed on license premises
	0.004	142	1202	Wine including coolers, consumed on license premises
Food store	0.078	600	5531	Retailing margins
	0.000	137	1161	Distilled alcohol beverages, bought in stores
	0.002	139	1191	Beer including coolers, bought in stores
	0.002	141	1201	Wine including coolers, bought in stores
Sport & recreation	0.014	642	5653	Other amusement and recreation services
	0.014	680	5850	Travelling and entertainment
Cultural & entertainment	0.017	642	5653	Other amusement and recreation services
	0.017	680	5850	Travelling and entertainment
Clothing & footwe	0.073	600	5531	Retailing margins
Other	0.012	600	5531	Retailing margins
	0.012	567	5321	Travel agents, tour wholesaler and operator services
Total	1.000			

Sources: Derived from Statistics Canada Travel Surveys or Residents of Canada and International Travel Surveys, 2000-2006.

b) Marine recreational boating

Data and approach

Economic impact studies for 2001 and 2006 have been conducted for the recreational boating industry in Canada (Genesis Public Opinion Research and Smith Gunther Associates, 2006; Goss Gilroy, 2001). However, only the 2006 study was used here since methodology appeared to differ between studies. It was not clear that the two studies included the same expenditures or generated economic impacts in the same way, thereby making trend estimates unreliable. The more recent study was the basis for recreational boating estimates derived here (including yachting, motor cruising and kayaking), while taking care to avoid double counting and freshwater components of overall boating activities. Specifically this meant omitting study findings for: recreational fishing, coastal tourism/recreation, boat building, government and research expenditures. Conversely, the study provided spending for: equipment and accessories, general retail, financing and insurance, food and beverage, repair and storage, travel and vehicle operation, fuel, facilities rental, and services provided by marinas and yacht clubs.

Detailed spending estimates broken down by province were available from the 2006 study. The saltwater component for each province was simply based on the proportion of coastal marinas and yacht clubs relative to the total including those inland. This resulted in nearly all spending for Atlantic and Pacific provinces being included (88-100%), but only 18% of Quebec spending due to the dominance of freshwater boating in that province.

Estimates of activity levels, such as days of recreational boating per year, did not emerge from these studies or other sources, therefore only spending estimates are presented in Table C-14. BC represents the largest share of saltwater recreational boating, followed by Québec, then the Atlantic provinces. In total, just over $1.3 billion in 2006 spending is associated with this sector.

Table C-14: Spending for marine-related Recreational boating by province, 2000-2006

($000s)	2006
BC	$925,830
QC	$238,765
NS	$75,945
NB	$62,203
NL	$51,325
PE	$15,314
Canada	$1,369,382

Source: Genesis Public Opinion Research Inc. & Smith Gunther Associates. *Economic Impact of the Canadian Recreational Boating Industry: 2006.*

Input-output concordance

Nine broad spending categories were created based on the expenditure data that was used from the studies (Table C-15). Some of these were further subdivided and aligned with the most suitable StatCan 2005 IO model commodity codes and numbers. The weights according to the broad categories were based on the expenditure data from the studies, and the weights for further subdivision were based on national spending patterns available from StatCan. One national average weighting was used for all provinces. The estimated expenditure amounts for each category by jurisdiction were then entered into a StatCan I/O template to flow through to the assigned commodities in the model to generate impacts.

Table C-15: Recreational boating expenditure concordance and weighting for StatCan 2005 IO model

Category	Weight	StatCan No.	StatCan Code	Description
Equipment &	0.039	396	3520	Pleasure boats and sporting craft
accessories	0.010	379	3391	Non-commercial trailers
Retail	0.354	600	5531	Retailing margins
Finance	0.035	617	5562	Non-life insurance
Food &	0.014	649	57001	Meals (outside home)
beverage	0.000	138	1162	Distilled alcohol beverages, license premises
	0.000	140	1192	Beer including coolers, license premises
	0.000	142	1202	Wine including coolers, license premises
	0.000	137	1161	Distilled alcohol beverages, bought in stores
	0.001	139	1191	Beer including coolers, bought in stores
	0.001	141	1201	Wine including coolers, bought in stores
Repair, store	0.107	394	3500	Ship repairs
Construction	0.025	554	5240	Non-residential building construction
Travel &	0.060	446	3950	Motor gasoline
vehicles	0.150	560	5301	Air transportation, passenger
	0.087	448	3962	Diesel oil
	0.003	451	3970	Lubricating oils and greases
Fuel	0.021	446	3950	Motor gasoline
Facilities rental:	0.092	625	5594	Non-residential rent
Total	1.000			

c) Beach activities

Data and approach

There is a great deal of other local recreation activity that is difficult to measure either in terms of participation levels or spending. An attempt has been made here to address the challenge by capturing participation estimates for two activities: recreational swimming and paddling (canoeing and kayaking). The Travel Activities and Motivation Surveys (StatCan 2001 and 2006) contain questions regarding traveler's participation in outdoor water-based activities in their home province of residence. The surveys also contain questions that distinguish saltwater and freshwater location for these activities, thereby providing a basis for ocean-sector estimates. Respondents indicated whether they "participate" or "frequently participate", and only the latter component is used here. The surveys provide population weighted estimates for the number of "frequent" participants across Canada. Atlantic region figures were distributed across provinces according to population. Interpolation was used to derive estimates for years between surveys.

The report on "The Importance of Nature to Canadians" (Environment Canada, 1996) provides some indication of what "frequent" participation means for these activities across Canada. For paddling and swimming (ranging from 5-30 days per year), national average estimates of 10 and 20 days per year were used for these activities respectively. A nominal spending estimate of $10 and $15 was applied to each participation day for swimming and paddling respectively. These estimates were considered reasonable lower bound estimates equivalent to the local transport and food spending associated with recreational tourism, with some additional expense for paddling equipment and transport. Combining the number of participants, number of participation days, and spending per day, estimates of recreational swimming and paddling spending were derived (Table C-17). The much larger number of participation days for swimming over-shadows the slightly lower per day expense, and swimming accounts for 94% of the totals shown.

Table C-16: Days of participation for beach activities by province, 2000-2006

Days	2000	2001	2002	2003	2004	2005	2006
Quebec	11,809,760	11,643,388	11,465,578	11,276,330	11,075,644	10,863,520	10,639,958
British Columl	5,557,157	5,567,168	5,576,866	5,586,252	5,595,325	5,604,085	5,612,532
Nova Scotia	1,765,301	1,777,604	1,790,031	1,802,584	1,815,262	1,829,439	1,847,710
New Brunswic	1,408,257	1,418,071	1,427,985	1,437,999	1,448,113	1,459,026	1,468,910
Newfounfland	972,287	979,063	985,908	992,822	999,805	1,003,373	1,005,209
Prince Edward	258,763	260,566	262,388	264,228	266,086	269,374	271,641
Canada	44,245,497	44,742,335	45,230,277	45,709,323	46,179,473	46,640,727	47,093,084

Sources: StatCan. Travel Activities and Motivations Survey, 2006; Environment Canada. 2006. The Importance of Nature to Canadians.

Table C-17: Expenditures for beach activities by province, 2000-2006

($000s)	2000	2001	2002	2003	2004	2005	2006
Quebec	$121,338	$119,444	$117,436	$115,314	$113,077	$110,726	$108,261
British Columl	$57,264	$57,274	$57,280	$57,284	$57,285	$57,282	$57,276
Nova Scotia	$18,639	$18,700	$18,763	$18,826	$18,891	$18,971	$19,094
New Brunswic	$14,869	$14,918	$14,968	$15,018	$15,070	$15,130	$15,179
Newfounfland	$10,266	$10,300	$10,334	$10,369	$10,405	$10,405	$10,387
Prince Edward	$2,732	$2,741	$2,750	$2,760	$2,769	$2,793	$2,807
Canada	$457,973	$461,747	$465,431	$469,027	$472,533	$475,951	$479,279

Sources: StatCan. Travel Activities and Motivations Survey, 2006; Environment Canada. 2006. The Importance of Nature to Canadians; StatCan, 2006. Travel Survey of Residents of Canada.

Input-output concordance

As described, the basic spending categories included vehicle operation, food, and equipment. One set of national expenditure categories and weights was assigned to the StatCan 2005 IO model on the basis of equivalent recreational tourism spending patterns. The estimated expenditure amounts for each category by jurisdiction were then entered into a StatCan I/O template to flow through to the assigned commodities in the model to generate impacts.

Table C-18: Recreation expenditure weighting and concordance for StatCan 2005 IO model commodity code

Category	Weight	StatCan No.	StatCan Code	Description
Vehicle	0.222	597	55101	Automotive repair and maintenance service
operation	0.222	446	3950	Motor gasoline
	0.011	448	3962	Diesel oil
	0.069	451	3970	Lubricating oils and greases
Food	0.256	600	5531	Retailing margins
	0.001	137	1161	Distilled alcohol beverages, bought in stores
	0.005	139	1191	Beer including coolers, bought in stores
	0.005	141	1201	Wine including coolers, bought in stores
Equipment	0.210	600	5531	Retailing margins
Total	1.000			

Table C-19: Summary – total tourism/recreation expenditures, 2006 (all activities)

$000s	Coastal tourism	Boating	Local beach activities	Total coastal	Recreational fishing	Cruise travel	Total
Province							
British Columbia	690,869	925,830	57,276	1,673,975	661,954	408,000	2,743,930
Quebec	190,300	238,765	108,261	537,326	48,691	27,000	613,017
Nova Scotia	271,982	75,945	19,094	367,021	18,793	19,000	404,814
New Brunswick	162,327	62,203	15,179	239,709	6,981	6,000	252,690
Newfoundland	128,167	51,325	10,387	189,879	39,714	3,000	232,592
Prince Edward Is.	65,542	15,314	2,807	83,663	2,206	2,000	87,868
Nunavut	1,211			1,211	872	7,000	9,083
NWT	473			473			473
Canada	1,510,872	1,369,382	213,004	3,093,258	779,210	472,000	4,344,468

Source: Tables C-12, C-14 and C-17.

APPENDIX D: MARINE CONSTRUCTION EXPENDITURES

Table D-1: Capital expenditures by port

Values in $000s	2002	2003	2004	2005	2006	5-year avg.
St. John's	4,528	1,419	1,856	3,244	466	2,303
Halifax	3,563	6,019	10,607	10,262	26,042	11,298
Saint John	n.a.	3,373	7,253	1,548	1,232	3,352
Montreal	21,280	24,723	8,050	17,088	23,079	18,844
Quebec	19,035	3,556	5,050	4,587	8,622	8,170
Sept-Iles	633	558	1,389	3,630	3,629	1,968
Trois-Rivieres	401	3,973	7,837	5,543	306	3,612
Sub-total Atlantic	49,439	43,621	42,042	45,902	63,376	49,547
Vancouver	25,448	13,083	33,835	21,909	23,321	23,519
Prince Rupert	719	2,122	2,264	22,020	64,717	18,368
Nanaimo	4,371	1,003	1,045	905	926	1,650
Sub-total Pacific	30,538	16,208	37,143	44,834	88,963	43,537
Total	79,977	59,829	79,186	90,736	152,340	93,084

Source: port authority annual reports and Luc Forcier, Trois-Rivières Port Authority; Mario Bernard, Port de Quebec; Tim Gilfoy, Strait of Canso Superport Corporation; Rebecca Penz, Greater Victoria Harbour Authority Cindy Mah, Port Alberni Port Authority; Jacqueline Gale,Prince Rupert Port Authority;

Table D-2: DND maritime capital expenditures by province

Values in $000s	2002	2003	2004	2005	2006	5-year avg.
Bases in:						
Newfoundland and Labrador	1,379	853	2,827	2,800	4,247	2,421
Nova Scotia	50,110	58,857	52,183	53,032	50,147	52,866
Brirish Columbia	17,664	8,190	14,448	41,286	42,245	24,767
Total	69,153	67,900	69,458	97,118	96,639	80,054

Source: DND, Estimated Expenditures by Electoral District and Province, annual.

Table D-3: Offshore oil & gas development expenditures by area and province

	Grand Banks			Scotian Shelf			
Values in $000s	Newfoundland and Labrador	Elsewhere	Total	Nova Scotia	Elsewhere	Total	Total Atlantic
2002	172,480	320,320	492,800	93,000	207,000	300,000	265,480
2003	192,850	358,150	551,000	125,000	278,000	403,000	317,850
2004	215,880	400,920	616,800	97,000	272,000	369,000	312,880
2005	152,800	283,660	436,460	52,000	221,000	273,000	204,800
2006	20,100	37,310	57,410	109,000	214,000	323,000	129,100
5-year avg.	150,822	280,072	430,894	95,200	238,400	333,600	246,020

Source: CNLOPB and CNSOPB

Table D-4: DFO Small Craft Harbours capital spending, 2003-2006

Values in $000	2003	2004	2005	2006	4-year avg
Newfoundland	7,063	8,031	7,432	9,641	8,042
Maritimes	8,790	10,926	6,342	9,030	8,772
Gulf	6,508	4,736	7,751	6,740	6,434
Quebec	0	0	0	0	0
Central & Arctic	480	1,594	1,824	1,123	1,255
Pacific	2,363	2,861	3,569	4,612	3,351
Total	25,204	28,148	26,918	31,145	27,854

Note: Impact analysis excludes Central & Arctic because expenditures are in Great Lakes ports.
Source: DFO special tabulation

Table D-5: Construction price index

	1997=100	2005=100
2002	119	1.19
2003	122	1.16
2004	135	1.05
2005	142	1.00
2006	155	0.92

Source: Statistics Canada, Cat. No. 327-0039

Table D-6: Capital expenditures by port ($2005)

Values in $000s (2005)	2002	2003	2004	2005	2006	5-year avg.
St. John's	5,403	1,652	1,953	3,244	427	2,536
Halifax	4,251	7,006	11,157	10,262	23,858	11,307
Saint John	0	3,926	7,629	1,548	1,129	2,846
Montreal	25,393	28,776	8,467	17,088	21,143	20,174
Quebec	22,714	4,139	5,312	4,587	7,899	8,930
Sept-Iles	755	649	1,461	3,630	3,325	1,964
Trois-Rivieres	479	4,624	8,243	5,543	280	3,834
Sub-total Atlantic	58,995	50,773	44,222	45,902	58,061	51,590
Vancouver	30,367	15,228	35,589	21,909	21,365	24,892
Prince Rupert	858	2,470	2,381	22,020	59,289	17,404
Nanaimo	5,216	1,167	1,099	905	848	1,847
Sub-total Pacific	36,440	18,865	39,069	44,834	81,502	44,142
Total	95,435	69,637	83,291	90,736	139,563	95,732

Source: Table D-1 adjusted by Table D-5 construction price index.

Table D-7: DND maritime capital expenditures by province ($2005)

Values in $000s (2005)	2002	2003	2004	2005	2006	5-year avg.
Bases in:						
Newfoundland and Labrador	1,646	993	2,974	2,800	3,891	2,461
Nova Scotia	59,795	68,506	54,889	53,032	45,941	56,433
British Columbia	21,078	9,533	15,197	41,286	38,702	25,159
Total	82,519	79,031	73,060	97,118	88,534	84,052

Source: Table D-2 adjusted by Table D-5 construction price index.

Table D-8: Offshore oil & gas development expenditures ($2005)

	Grand Banks			Scotian Shelf			
Values in $000s (2005)	Newfoundland and Labrador	Elsewhere	Total	Nova Scotia	Elsewhere	Total	Total Atlantic
2002	205,816	382,231	588,047	110,975	247,008	357,983	316,791
2003	224,465	416,863	641,328	145,492	323,574	469,066	369,957
2004	227,074	421,708	648,782	102,030	286,104	388,133	329,103
2005	152,800	283,660	436,460	52,000	221,000	273,000	204,800
2006	18,414	34,181	52,595	99,858	196,052	295,910	118,272
5-year avg.	165,714	307,729	473,442	102,071	254,747	356,818	267,785

Source: Table D-3 adjusted by Table D-5 construction price index.

Table D-9: DFO Small Craft Harbours capital spending ($2005)

Values in $000 (2005)	2003	2004	2005	2006	4-year avg
Newfoundland	8,221	8,447	7,432	8,832	8,233
Maritimes	10,231	11,492	6,342	8,273	9,084
Gulf	7,575	4,982	7,751	6,175	6,621
Quebec	0	0	0	0	0
Central & Arctic	559	1,676	1,824	1,028	1,272
Pacific	2,750	3,009	3,569	4,225	3,388
Total	29,336	29,607	26,918	28,533	28,598

Source: Table D-4 adjusted by Table D-5 construction price index.

APPENDIX E: SHIPBUILDING AND BOAT BUILDING VALUE OF OUTPUT

Table E-1: Shipbuilding and boat building industries value of output

Values in $000s	2002	2003	2004	2005	2006
Newfoundland and labrador	36,000	75,000	50,000	67,000	69,000
Nova Scotia	417,000	185,000	235,000	145,000	202,000
New Brunswick	17,000	19,000	12,000	4,000	14,000
Prince Edward Island	38,000	27,000	35,000	39,000	36,000
Québec	250,000	301,000	343,000	243,000	299,000
Sub-total Atlantic	758,000	607,000	675,000	498,000	620,000
British Columbia	400,000	445,000	394,000	413,000	446,000
Sub-total Pacific	400,000	445,000	394,000	413,000	446,000
Total Canada	1,158,000	1,052,000	1,069,000	911,000	1,066,000

Source: Statistics Canada, special tabulation

APPENDIX F: FEDERAL AND PROVINCIAL GOVERNMENT EXPENDITURES

Table F-1: DND expenditures, Atlantic region

	Personnel		Expenditures ($000s)			
	FTE	Gross income	O&M	Capital	G&C	Total
Halifax Greenwood						
2002	10,316	532,343	187,641	50,110	6,010	776,104
2003	10,395	551,582	197,891	58,857	9,282	817,612
2004	10,297	534,695	226,625	52,183	2,763	816,266
2005	10,693	547,123	249,680	53,032	2,625	852,459
2006	10,709	613,696	250,106	50,147	4,012	917,960
St. John's						
2002	369	25,236	33,195	1,379	0	59,810
2003	389	25,525	30,002	853	2,689	59,069
2004	336	23,620	23,341	2,827	648	50,436
2005	306	24,911	25,938	2,801	788	54,438
2006	296	25,464	29,852	4,247	168	59,731
Québec						
2006	1,650	102,500	13,600			116,100
Ottawa						
2006	540	33,700	574,200			607,900
DND Atlantic total						
2006	13,195	775,360	867,758	54,394	4,180	1,701,691

Source: DND, *Estimated Expenditures by Electoral District and Province*, annual reports; DND pers. comm.

Table F-2: DND expenditures, Pacific region

	Personnel		Expenditures ($000s)			
	FTE	Gross income	O&M	Capital	G&C	Total
Esquimalt/Comox						
2002	7,448	375,212	59,974	17,664	1,140	453,990
2003	7,583	417,644	67,460	8,190	113,462	606,756
2004	7,639	406,655	49,449	14,448	68	470,620
2005	7,776	419,947	52,563	41,286	1,519	515,315
2006	7,676	455,569	94,658	42,245	663	593,135

Source: DND, *Estimated Expenditures by Electoral District and Province*, annual reports; DND pers. comm.

Table F-3: DFO expenditures by region, with estimates of marine/freshwater breakdown

Region	Fiscal Year ($000s) 2003		2004		2005		2006		2007	
	Marine	Fresh	Marine	Fresh	Marine	Fresh	Marine	Fresh	Marine	Fresh
Newfoundland										
Fisheries/oceans	86,087	4,531	90,197	4,747	86,802	4,569	99,740	5,249	102,419	5,390
Coast Guard	87,315	0	94,364	0	99,602	0	105,053	0	110,480	0
	173,403	4,531	184,561	4,747	186,404	4,569	204,792	5,249	212,899	5,390
Maritimes										
Fisheries/oceans	124,936	6,576	146,585	7,715	125,703	6,616	126,258	6,645	121,704	6,405
Coast Guard	102,895	0	113,831	0	118,337	0	117,121	0	117,847	0
	227,831	6,576	260,416	7,715	244,040	6,616	243,379	6,645	239,550	6,405
Québec										
Fisheries/oceans	78,845	4,150	70,841	3,728	78,153	4,113	93,147	4,902	78,863	4,151
Coast Guard	56,403	24,173	59,308	25,418	61,225	26,239	65,165	27,928	68,924	29,539
	135,247	28,322	130,150	29,146	139,377	30,352	158,312	32,830	147,787	33,690
Gulf										
Fisheries/oceans	66,903	3,521	66,932	3,523	73,619	3,875	87,589	4,610	63,341	3,334
Central & Arctic										
Fisheries/oceans	22,953	53,558	24,578	57,350	26,769	62,460	27,513	64,197	27,381	63,888
Coast Guard	20,076	46,845	19,914	46,465	20,347	47,477	19,659	45,871	22,756	53,098
	43,030	100,402	44,492	103,815	47,116	109,937	47,172	110,068	50,137	116,986
Pacific										
Fisheries/oceans	176,631	19,626	168,648	18,739	169,937	18,882	182,985	20,332	200,074	22,230
Coast Guard	93,839	0	106,257	0	113,182	0	129,337	0	122,354	0
	270,471	19,626	274,905	18,739	283,119	18,882	312,322	20,332	322,428	22,230
National Capital Region										
Fisheries/oceans	479,575	84,631	292,629	51,640	308,738	54,483	358,916	63,338	328,897	58,041
Marine/fresh total	1,396,460	247,609	1,254,085	219,325	1,282,413	228,714	1,412,482	243,073	1,365,040	246,076

Source: DFO special tabulation

Table F-4: Transport Canada and Pilotage Authorities expenditures, 2006

Transport Canada expenditures in $000s	Personnel Costs	Other Operating	Capital	G&C	Statutory	Total
Ports	2,751	11,878	8,261	2,172		25,062
Ferry Services	603	1,872		36,802		39,277
Transportation of Dangerous Goods	1	1				2
Marine Atlantic Inc.	11,359	69,573	1,149			82,081
St. Lawrence Seaway Management Corporation					20,000	20,000
Marine Security	10,568	8,304	683	12,559		32,114
Marine Regulation	2,253	1,667	16			3,936
Small Commercial Vessels (SCV)	1,472	381	12			1,865
Large Commercial Vessels	2,304	419	32			2,755
Port State Control	922	219	4			1,145
Marine Safety	10,939	3,934	496			15,370
Certification of Seafarers	3,545	2,403	136			6,084
Vessel registration program	1,309	231	6			1,546
Canada Port Authorities (CPA)	31	3				34
Sub-total Transport Canada	48,058	100,885	10,795	51,533	20,000	231,271
Net of subsidies	36,096	29,440				65,536
Atlantic region expenditures (56%)	20,214	16,487				36,700
Pacific region expenditures (20%)	7,219	5,888				13,107
Pilotage Authorities expenditures*	89,000	59,000				148,000
Atlantic region expenditures (25%)	27,000	18,000				45,000
Pacific region expenditures (33%)	30,000	20,000				50,000

Source: Transport Canada national data, special tabulation; regional estimates based on cargo tonnage.
Pilotage Authorities data from Atlantic and Pacific Pilotage Authorities, annual reports.
*Fully recovered through pilotage fees.

Table F-5: Provincial government marine-related expenditures, 2006

Expenditures in $000s	Provincial Expenditures	Offshore Petroleum Board	Total
Newfoundland & Labrador	29,056	8,331	37,387
Nova Scotia	28,763	4,875	33,639
New Brunswick	10,732		10,732
Prince Edward Island	4,627		4,627
Quebec	7,691		7,691
British Columbia	155,780		155,780
NWT	6,260		6,260
Nunavut	3,534		3,534
Total	242,910	13,206	259,650

Source: Table F-6

Table F-6: Marine-related expenditures by province and department/agency, 2006

Expenditures in $000s	BC	NL	NS	NB	QC	NWT	PEI	Nunavut
Fisheries & Aquaculture	10,000	9,521	6,107	5,322	7,691	2,000	1,608	1,400
Tourism	16,420	3,643	7,202	5,410		230	3,019	
Transportation	108,400	12,135	7,414			2,900		2,000
Energy	2,760		7,255					
Offshore Boards		8,331	4,875					
Natural Resources		3,758	785					
Agriculture and Lands								
Economic Development	6,000							
Environment	2,200					490		110
Other	10,000					640		24
Totals	155,780	37,387	33,639	10,732	7,691	6,260	4,627	3,534

Source: Provincial and territorial departments and agencies; Departments of Finance, budget estimates, 2006-07

APPENDIX G: ECONOMIC IMPACT MULTIPLIERS FOR MARINE-RELATED ACTIVITIES

Table G-1: Newfoundland and Labrador

Marine activity	GDP*			Employment**			Income*		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.43	0.12	0.12	4.66	1.95	1.39	0.29	0.06	0.09
Aquaculture	0.45	0.19	0.14	4.83	2.68	1.58	0.12	0.09	0.05
Fish processing	0.25	0.33	0.13	5.30	4.64	2.09	0.17	0.11	0.07
Oil & gas exploration/extraction	0.85	0.11	0.01	0.35	0.16	0.11	0.02	0.01	0.01
Support activities for oil & gas	0.46	0.19	0.14	4.00	2.42	1.35	0.19	0.07	0.06
Water transportation	0.35	0.13	0.11	7.00	2.60	2.02	0.30	0.06	0.09
Support activities for transportation	0.55	0.10	0.14	11.50	2.72	2.99	0.41	0.06	0.12
Tourism & recreation	0.40	0.30	0.15	11.00	6.00	3.57	0.28	0.22	0.13
Oil & gas facilities construction	0.45	0.10	0.12	3.50	1.77	1.11	0.25	0.06	0.08
Ports and harbours construction	0.40	0.20	0.13	6.00	2.00	1.68	0.26	0.07	0.08
Shipbuilding	0.47	0.08	0.12	11.65	1.37	2.73	0.34	0.03	0.09
Boat building	0.41	0.08	0.11	12.50	1.44	2.93	0.42	0.03	0.11
National Defence	0.45	0.35	0.18	5.45	2.50	1.67	0.45	0.07	0.13
Fisheries & Oceans	0.48	0.27	0.17	7.10	0.91	1.68	0.48	0.07	0.14
Other federal departments	0.66	0.12	0.17	6.82	2.22	1.90	0.66	0.07	0.18
Provincial departments	0.70	0.13	0.18	6.14	2.90	1.90	0.7	0.15	0.21
Universities	0.70	0.13	0.18	9.50	2.28	2.47	0.55	0.06	0.15
ENGOs	0.65	0.06	0.16	10.00	3.54	3.26	0.40	0.10	0.13

*Impact per $1 of industry output. **Impact per $1 million of industry output.

Source: Statistics Canada.

Table G-2: Nova Scotia

Marine activity	GDP			Employment			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.52	0.12	0.17	7.18	2.05	2.31	0.37	0.06	0.12
Aquaculture	0.43	0.20	0.16	7.22	2.01	2.31	0.21	0.10	0.09
Fish processing	0.24	0.29	0.14	7.89	4.61	3.13	0.18	0.13	0.09
Oil & gas exploration/extraction	0.85	0.06	0.03	0.55	1.38	0.48	0.04	0.05	0.03
Support activities for oil & gas	0.46	0.37	0.20	6.30	3.12	2.36	0.32	0.11	0.12
Water transportation	0.41	0.10	0.13	5.70	1.32	1.76	0.33	0.06	0.11
Support activities for transportation	0.54	0.20	0.19	13.27	1.75	3.76	0.47	0.07	0.15
Tourism & recreation	0.42	0.25	0.17	12.00	7.00	4.75	0.30	0.25	0.15
Oil & gas facilities construction	0.50	0.30	0.21	3.50	1.75	1.31	0.24	0.06	0.08
Ports and harbours construction	0.40	0.20	0.16	6.00	9.00	3.75	0.26	0.32	0.16
Shipbuilding	0.50	0.12	0.16	8.04	2.01	2.51	0.32	0.07	0.11
Boat building	0.40	0.16	0.15	9.00	2.81	2.95	0.22	0.06	0.08
National Defence	0.71	0.14	0.22	12.28	2.92	3.80	0.71	0.11	0.23
Fisheries & Oceans	0.50	0.28	0.20	7.60	1.23	2.21	0.50	0.07	0.16
Other federal departments	0.70	0.15	0.22	6.20	3.10	2.33	0.70	0.09	0.22
Provincial departments	0.70	0.15	0.22	5.54	6.76	3.08	0.70	0.18	0.25
Universities	0.71	0.12	0.22	9.72	2.70	3.11	0.55	0.07	0.17
ENGOs	0.77	0.11	0.23	17.27	1.75	4.76	0.67	0.05	0.20

*Impact per $1 of industry output. **Impact per $1 million of industry output.
Source: Statistics Canada.

Table G-3: New Brunswick

Marine activity	GDP			Employment			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.69	0.09	0.18	10.44	1.30	3.05	0.44	0.04	0.13
Aquaculture	0.31	0.16	0.11	4.62	2.70	1.90	0.13	0.08	0.06
Fish processing	0.20	0.11	0.07	4.45	1.91	1.65	0.14	0.06	0.06
Oil & gas exploration/extraction									
Support activities for oil & gas									
Water transportation	0.40	0.10	0.12	4.00	2.54	1.70	0.20	0.13	0.09
Support activities for transportation	0.54	0.15	0.16	11.70	2.37	3.66	0.74	0.17	0.25
Tourism & recreation	0.40	0.20	0.14	13.00	9.00	5.72	0.33	0.32	0.18
Oil & gas facilities construction									
Ports and harbours construction	0.40	0.20	0.14	6.00	9.00	3.90	0.26	0.32	0.16
Shipbuilding	0.41	0.14	0.13	6.93	1.76	2.26	0.19	0.06	0.07
Boat building	0.41	0.09	0.12	10.00	1.07	2.88	0.61	0.03	0.18
National Defence									
Fisheries & Oceans	0.31	0.26	0.13	4.70	0.43	1.33	0.31	0.03	0.09
Other federal departments	0.70	0.14	0.19	7.65	2.47	2.63	0.7	0.07	0.22
Provincial departments	0.70	0.14	0.19	5.46	4.97	2.71	0.7	0.14	0.24
Universities	0.71	0.13	0.19	9.00	2.52	3.00	0.56	0.05	0.17
ENGOs	0.70	0.05	0.17	13.00	1.37	3.74	0.55	0.03	0.16

*Impact per $1 of industry output. **Impact per $1 million of industry output.

Source: Statistics Canada.

Table G-4: Prince Edward Island

Marine activity	GDP			Employment			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.62	0.07	0.14	6.26	1.38	2.06	0.45	0.05	0.13
Aquaculture	0.74	0.11	0.18	13.61	2.19	4.27	0.35	0.07	0.11
Fish processing	0.14	0.31	0.09	9.10	5.36	3.90	0.19	0.11	0.08
Oil & gas exploration/extraction									
Support activities for oil & gas									
Water transportation	0.20	0.06	0.05	6.60	2.27	2.39	0.20	0.14	0.09
Support activities for transportation	0.46	0.13	0.12	6.00	2.66	2.34	0.15	0.07	0.06
Tourism & recreation	0.38	0.20	0.12	10.00	5.00	4.05	0.25	0.18	0.11
Oil & gas facilities construction									
Ports and harbours construction	0.40	0.20	0.13	7.00	7.00	3.78	0.31	0.25	0.14
Shipbuilding	0.41	0.06	0.10	2.70	0.73	0.93	0.09	0.02	0.03
Boat building	0.39	0.06	0.09	9.83	1.17	2.97	0.27	0.03	0.08
National Defence									
Fisheries & Oceans	0.31	0.26	0.12	4.70	0.43	1.39	0.31	0.07	0.10
Other federal departments	0.70	0.13	0.17	8.92	2.36	3.05	0.51	0.05	0.14
Provincial departments	0.70	0.13	0.17	6.76	4.86	3.14	0.33	0.12	0.11
Universities	0.74	0.14	0.18	14.00	2.56	4.47	0.59	0.05	0.16
ENGOs	0.85	0.14	0.21	22.00	2.03	6.49	0.80	0.10	0.23

*Impact per $1 of industry output. **Impact per $1 million of industry output.
Source: Statistics Canada.

Table G-5: Québec

Marine activity	GDP			Employment			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.60	0.13	0.25	5.85	1.95	2.89	0.38	0.08	0.17
Aquaculture	0.60	0.18	0.27	5.92	2.53	3.13	0.17	0.08	0.09
Fish processing	0.20	0.23	0.15	3.50	1.77	1.95	0.14	0.06	0.07
Oil & gas exploration/extraction									
Support activities for oil & gas									
Water transportation	0.45	0.17	0.21	6.00	2.81	3.26	0.34	0.12	0.17
Support activities for transportation	0.52	0.35	0.30	7.60	4.03	4.30	0.32	0.13	0.17
Tourism & recreation	0.51	0.35	0.29	12.00	8.00	7.40	0.32	0.29	0.23
Oil & gas facilities construction									
Ports and harbours construction	0.40	0.20	0.20	6.00	4.00	3.70	0.26	0.14	0.15
Shipbuilding	0.40	0.14	0.18	15.00	6.74	8.04	0.70	0.23	0.34
Boat building	0.38	0.19	0.19	6.76	2.61	3.47	0.25	0.09	0.13
National Defence	0.88	0.12	0.34	14.20	1.50	5.81	0.88	0.08	0.36
Fisheries & Oceans	0.44	0.12	0.19	6.50	1.14	2.83	0.44	0.06	0.19
Other federal departments	0.41	0.12	0.18	6.88	4.95	4.38	0.41	0.12	0.20
Provincial departments	0.30	0.13	0.15	6.81	5.00	4.37	0.3	0.13	0.16
Universities	0.75	0.14	0.30	9.40	2.26	4.31	0.56	0.07	0.23
ENGOs	0.74	0.13	0.30	16.04	2.00	6.67	0.62	0.02	0.24

*Impact per $1 of industry output. **Impact per $1 million of industry output.
Source: Statistics Canada.

Table G-6: British Columbia

Marine activity	GDP			Employment			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.45	0.16	0.21	1.39	2.10	1.08	0.26	0.10	0.13
Aquaculture	0.27	0.30	0.19	3.97	4.16	2.52	0.12	0.15	0.09
Fish processing	0.30	0.20	0.17	6.12	2.24	2.59	0.17	0.09	0.09
Oil & gas exploration/extraction									
Support activities for oil & gas									
Water transportation	0.45	0.20	0.22	5.00	2.49	2.32	0.30	0.11	0.14
Support activities for transportation	0.52	0.16	0.23	6.96	3.62	3.28	0.32	0.12	0.15
Tourism & recreation	0.43	0.30	0.25	10.00	5.00	4.65	0.35	0.18	0.19
Oil & gas facilities construction									
Ports and harbours construction	0.40	0.30	0.24	6.00	5.00	3.41	0.26	0.18	0.15
Shipbuilding	0.47	0.16	0.21	6.21	2.18	2.60	0.33	0.09	0.15
Boat building	0.41	0.15	0.19	4.39	2.04	1.99	0.16	0.08	0.08
National Defence	0.82	0.10	0.31	13.95	1.80	4.88	0.82	0.06	0.31
Fisheries & Oceans	0.47	0.29	0.26	7.16	1.35	2.64	0.47	0.07	0.19
Other federal departments	0.65	0.18	0.28	7.00	3.08	3.12	0.65	0.10	0.26
Provincial departments	0.70	0.15	0.29	3.51	8.44	3.70	0.7	0.26	0.34
Universities	0.74	0.15	0.30	11.43	1.79	4.10	0.58	0.05	0.22
ENGOs	0.77	0.10	0.30	13.89	1.49	4.77	0.67	0.05	0.25

*Impact per $1 of industry output. **Impact per $1 million of industry output.

Source: Statistics Canada.

APPENDIX H: STATUS OF QUANTIFYING EACH MARINE ACTIVITY

Sector	Industry	Estimation	Inclusions & Exclusions
Seafood	Fishing	Good	
	Aquaculture	Good	
	Processing	Good	
	Marketing & Distribution	Under estimated	Not considered in this study.
	Subsistence Fishing	Under estimated	Current scope and significance unknown. Data not systematically compiled.
Oil & Gas	Exploration & Extraction	Good	
	Support Services	Good	
	Refineries	Under estimated	Not quantified due to lack of data.
	Pipeline Transportation	Good	
Marine Transportation	Freight and passenger transportation	Under estimated	"Own account" shipping excluded.
	Support activities for marine transportation	Good	Estimate based on historical data
Tourism and Recreation	Recreational fishing	Conservative	
	Cruise Ship Travel	Conservative	
	Coastal Tourism & recreation	Conservative	Estimates based on several data sources
Marine Construction	Ports, Harbours and Marine works	Under estimated	Construction at private ports and marinas is excluded.

Sector	Industry	Estimation	Inclusions & Exclusions
	Oil and Gas facilities Installation	Over estimated	No distinction between fabrication and installation of facilities thus overstate pure construction activity.
	Other (Cable, renewable energy, etc)	Under estimated	Not considered in this study.
Marine Manufacturing	Navigation and Guidance Systems	Not estimated	Not quantified due to the lack of marine-specific data.
	Ship and boat building	Good.	Lack of clear distinction between building for marine and freshwater use.
	High Tech Manufacturing	Not estimated	Not considered in this study.
Services	Professional Services/ Environmental Consulting	Not estimated	Not considered in this study.
	High Tech Services	Under estimated	Not considered in this study.
Federal Government	National Defence	Under estimated	Accounting system limits ability to identify maritime expenditures
	Fisheries and Oceans	Good	Adjusted for freshwater programs
	Transport Canada	Good	
	Environment Canada	Good	

Sector	Industry	Estimation	Inclusions & Exclusions
	Parks Canada	Good	
	Natural Sciences & Engineering Research Council	Good	
	Indian & Northern Affairs	Good	
	Natural Resources Canada	Good	
	Canadian Food Inspection Agency	Good	
Provincial/Territorial Government	Fisheries & Aquaculture	Good	
	Transport/Ferries	Good	
	Energy	Good	
	Tourism	Good	
Municipal Governments		Not estimated	Not considered in this study.
Universities and Research	Universities and Research	Under estimated	Not all universities and programs covered.
Non Profit	ENGOs	Under estimated	Not all organizations represented and not all marine related expenditures necessarily captured.